Thermo Scientific KingFisher Flex

User Manual

Rev. 1.2

Part of Thermo Fisher Scientific

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Thermo Scientific KingFisher Flex

User Manual

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KingFisher Flex also has national and international patents pending.

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Consumables are not included in the warranty.

About This User Manual

Intended users

This user manual is written for the actual end user, for example, research scientist or laboratory technician, and provides information on the Thermo Scientific KingFisher Flex, including the installation and operating instructions.

Read the manual in its entirety before operating the instrument.

How to use this user manual

This user manual is designed to give you the information to:

- Review safety precautions
- Install the KingFisher Flex
- Use the KingFisher Flex in routine jobs – the processing step
- Perform basic cleaning and maintenance procedures
- Troubleshoot the instrument performance

This user manual also describes all the features and specifications of the KingFisher Flex hardware and onboard software. Refer to Chapter 7: “Technical Specifications”.

In Chapter 4: “Routine Operation” you find explanations of the processing principles and procedures and on how to use the KingFisher Flex internal software.

In Chapter 9: “Troubleshooting Guide” you find explanations of error and warning messages and a problem-solving guide. The user should be familiar with the contents of Chapter 5: “Maintenance”. For ordering information, refer to Chapter 10: “Ordering Information”.

For more information

For PC software-related issues, refer to the *Thermo Scientific BindIt Software User Manual* (Cat. no. N07974).

For the latest information on products and services, visit our websites at:

`http://www.thermo.com`
`http://www.thermo.com/kingfisher`

In our efforts to provide useful and appropriate documentation, we appreciate your comments on this user manual to your local Thermo Fisher Scientific representative.

Safety symbols and markings

These symbols are intended to draw your attention to particularly important information and alert you to the presence of hazards as indicated.

Safety symbols and markings used on the KingFisher Flex

The following symbols and markings appear on the type label and the instrument itself.

Power ON ▲

Power OFF ▲

Warning Hot surface, risk of burns. ▲

Warning Risk of body parts, hair, jewelry or clothing getting caught in a moving part. ▲

Serial number ▲

Catalog number ▲

Date of manufacture ▲

Consult instructions for use ▲

WEEE symbol This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. ▲

A black label with the following text (Figure 2–4):

WARNING: DISCONNECT SUPPLY BEFORE SERVICING

AVERTISSEMENT: COUPER L'ALIMENTATION AVANT L'ENTRETIEN ET LE DEPANNAGE

Warning and other markings used in the documentation

The following symbols and markings appear in this user manual.

Warning Risk of electric shock. ▲

Warning Biohazard risk. ▲

Warning Risk of injury to the user(s). ▲

Caution Risk of damage to the instrument, other equipment or loss of performance or function in a specific application. ▲

Note Marks a hint, important information that is useful in the optimum operation of the system, or an item of interest. ▲

Instrument safety and guidelines for use

- Always follow basic safety precautions when using the KingFisher Flex to reduce the risk of injury, biohazardous contamination, fire, or electric shock.
- Read this user manual in its entirety prior to operating the instrument. Failure to read, understand, and follow the instructions in the manual may result in damage to the instrument, injury to laboratory and operating personnel or poor instrument performance.
- Observe all "Warning", "Caution", and "Note" statements as well as safety symbols and markings on the instrument and in the documentation.
- The device shall be operated only with software specifically designed for the device.
- Never open any other covers of the KingFisher Flex than the see-through lid or the sliding door (Figure 2–3) while the instrument is plugged into a power source.
- Never force a microplate onto the instrument.
- The KingFisher Flex is intended for laboratory research use only. Observe proper laboratory safety precautions, such as wearing protective clothing and following approved laboratory safety procedures.
- Preventative maintenance instructions should be followed closely to keep the instrument in the best condition for maximum reliability. A poorly maintained instrument will not give the best results.

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field. ▲

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Chapter 1
Introduction to the KingFisher® Flex

Intended use

The KingFisher Flex magnetic particle processor (Figure 1–1) is intended for professional research use by trained personnel. The instrument is intended for automated transfer and processing of magnetic particles in a microplate scale. Use for self-testing is excluded. It is recommended that Good Laboratory Practices (GLP) are followed to guarantee reliable analyses.

Refer to Chapter 6: “Technical Specifications”.

Principle of operation

The KingFisher Flex magnetic particle processor (Figure 1–1) is designed for automated transfer and processing of magnetic particles in microplate format.

The patented technology of the KingFisher Flex system is based on the use of magnetic rods covered with a disposable, specially designed tip comb and plates. The instrument functions without any dispensing or aspiration parts or devices.

Samples and reagents, including magnetic particles, are dispensed into the plates according to the corresponding instructions. The protocol that is selected by the user via the keyboard and display have already been preloaded into the onboard software. BindIt Software can be used to create and run protocols.

Figure 1–1. KingFisher Flex magnetic particle processor

Advantages of using KingFisher Flex

The KingFisher Flex magnetic particle processor has several operational advantages:

- Enables automation of complicated manual steps
- Enables simultaneous processing and purification
- Binding and elution are enhanced due to the heating option
- Enables concentration of the sample during processing
- Facilitates a good collection of bead-bound sample due to the efficiency of the magnet
- Enables a quicker reaction and a more efficient wash due to the technology of moving magnetic particles instead of liquids
- No carryover
- No cross contamination
- Facilitates the whole processing with the aid of an internal program/BindIt Software.

Chapter 2
Functional Description

Instrument layout

This section shows the front, back and side views of the KingFisher Flex instrument.

Front view

The front views of the KingFisher Flex instrument are shown in Figure 2–2 and Figure 2–3.

Figure 2–2. KingFisher Flex front view without see-through lid

Figure 2–3. KingFisher Flex front view with see-through lid and plates

Back / side view

The back view of the KingFisher Flex instrument is shown in Figure 2–4 and the side view in Figure 2–5.

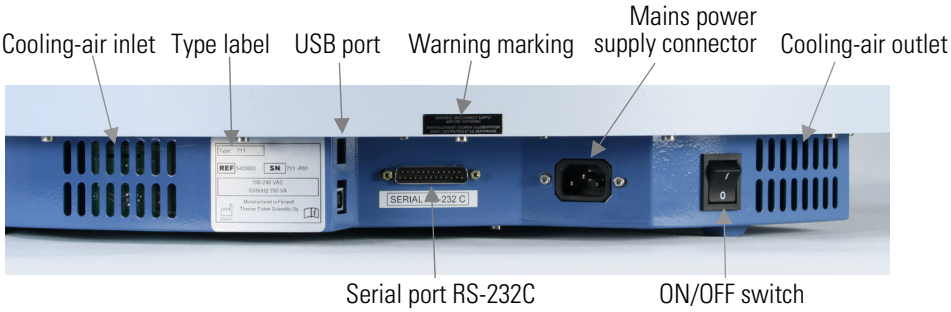


Figure 2–4. KingFisher Flex back view

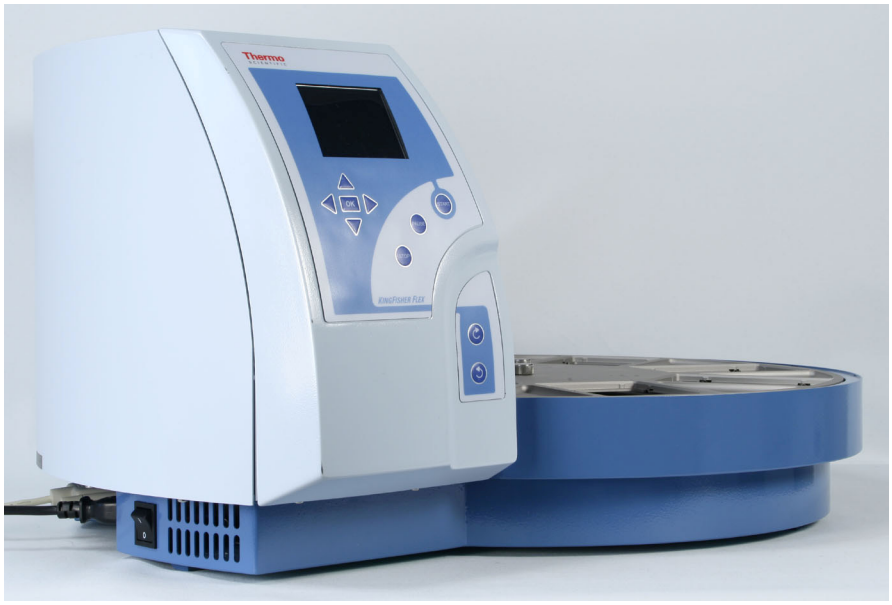


Figure 2–5. KingFisher Flex side view

KingFisher Flex magnetic particle processor

The KingFisher Flex (Figure 2–6) has room for eight plates. The tip combs are compatible with the plates. During the individual steps, the plates are kept stationary, and the only moving assembly is the processing head with tip comb and magnetic rods. The head consists of two vertically moving platforms. One is needed for the magnetic rods (24 or 96 pieces) and the other one for the plastic tip comb.

Up to eight plates can be simultaneously on the turntable. However, during one sample processing, the protocol enables the use of more than eight plates in total. One tip comb contains 24 or 96 tips used for processing 24 or 96 samples at a time.

Before starting the magnetic particle processing via the keypad and display, the samples and reagents are dispensed into the plates and the tip comb is placed onto a KingFisher plate, from which it is automatically loaded. The plates are placed onto the turntable into the corresponding plate stations according to the protocol instructions.

During the operation, the sliding door can be closed or open (Figure 2–3) or the whole see-through lid can be absent. The closed door protects the processing against environmental contamination.

The operating principle employed is MPP (inverse magnetic particle processing) technology (Figure 2–7). Rather than moving the liquids, the magnetic particles are moved from plate to plate containing specific reagents, in contrast to the external magnet method. Magnetic particles are transferred with the aid of magnetic rods covered with a disposable, specially designed plastic tip comb.

Figure 2–6. KingFisher Flex magnetic particle processor

Principle of magnetic particle processing

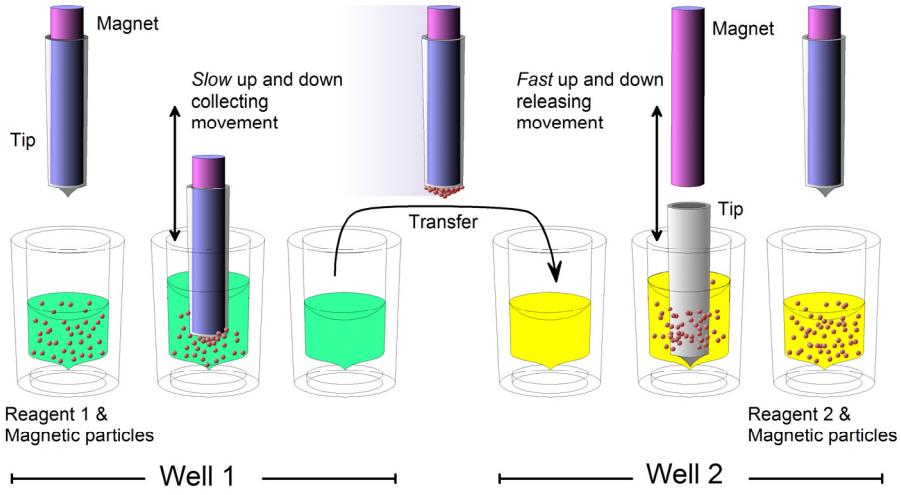


Figure 2–7. Inverse magnetic particle processing

Working with a magnetic rod

Working with magnetic particles can be divided into five separate processes:

- collecting magnetic particles
- releasing magnetic particles
- washing magnetic particles
- incubation
- concentration

Collecting magnetic particles

During the collection of the magnetic particles, the magnetic rod is fully inside the tip. The magnetic rods together with the tip comb move slowly up and down in the plate and the magnetic particles are collected onto the edge of the tips. The magnetic rods together with the tip comb, having collected the magnetic particles, can be lifted out of the plate and transferred into the next plate.

Releasing magnetic particles

After collection of the magnetic particles, the magnetic rods together with the tip comb are lifted from the plate, the magnetic rods are lifted off and the tip comb is lowered into the next plate containing a reagent.

Magnetic particles are released by moving the tip comb up and down several times at considerably high speed until all the particles have been mixed with the substance in the next reaction.

Washing magnetic particles

Washing the magnetic particles is a frequent and an important processing phase. Washing is a combination of the release and collection processes in a plate filled with washing solution.

To maximize washing efficiency, the magnetic rods together with the tip comb are designed to have minimized liquid-carrying properties.

Incubation

To keep the magnetic particle suspension evenly mixed in long-running reactions, the tip comb can be moved up and down in the solution.

Changing the volume during the magnetic particle processing

The volume of the first plate can be larger than the volume of the next plate, and this is used for concentration purposes (see Figure 2–8 below).

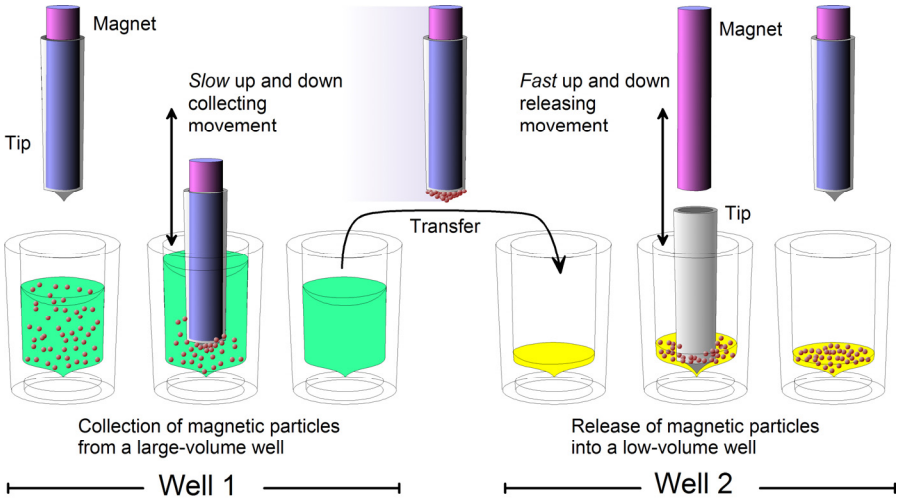


Figure 2–8. A concentration step during magnetic particle processing

Chapter 3
Installation

Delivery check

This section covers the relevant procedures to be carried out on receipt of the instrument.

Unpacking

Move the packed instrument to its site of operation. To prevent condensation, the instrument should be left in its protective, antistatic plastic wrapping until the ambient temperature has been reached. Unpack the KingFisher Flex instrument and accessories carefully with the arrows on the transport package pointing upwards. Remove the instrument from the package and place it on a level surface. Refer to the enclosed unpacking instructions.

The following notes and instructions are sent with the instrument and are immediately available when you open the package:

- Unpacking instructions
- KingFisher Flex Feedback Form
- Warranty Certificate card
- Packing instructions/Packing list
- *Thermo Scientific KingFisher Flex User Manual* and *Quick Reference Guide*
- Transportation discrepancy report
- BindIt Software package

Caution Do not touch or loosen any screws or parts other than those specifically designated in the instructions. Doing so might cause misalignment and will void the instrument warranty. ▲

Warning The KingFisher Flex weighs approximately 28 kg [62 lbs.] without the transport package and should be lifted with care. It is recommended that two persons lift the instrument together, taking the proper precautions to avoid injury. ▲

To lift the instrument, put your fingers under the bottom on either sides and lift it with your back straight.

Retain the original packaging and packing material for future transportation. The packaging is designed to assure safe transport and minimize transit damage. Use of alternative packaging materials may invalidate the warranty. Also retain all instrument-related documentation provided by the manufacturer for future use.

Checking delivery

Check the enclosed packing list against order. In case of any deviations, contact your local Thermo Fisher Scientific representative or Thermo Fisher Scientific Oy.

Visually inspect the transport package, the instrument and the accessories for any possible transport damage.

If the carton has been damaged in transit, it is particularly important that you retain it for inspection by the carrier in case there has also been damage to the instrument.

Neither the manufacturer nor its agents can be held responsible for any damage incurred in transit, but the manufacturer will make every effort to help obtain restitution from the carrier. Upon receipt of the carrier's inspection report, arrangements will be made for repair or replacement.

If any parts are damaged, contact your local Thermo Fisher Scientific representative or Thermo Fisher Scientific Oy.

Requirements

When you set up your KingFisher Flex, avoid sites of operation with excess dust, vibrations, strong magnetic fields, direct sunlight or UV light, draft, excessive moisture or large temperature fluctuations.

- Make sure the working area is flat, dry, clean and vibration-proof and leave additional room for accessories, cables, and reagent bottles.
- Make sure the ambient air is clean and free of corrosive vapors, smoke and dust.
- Make sure the ambient temperature range is between +5°C (41°F) and +40°C (104°F).
- Make sure relative humidity is between 10% and 80% (non-condensing).

Leave sufficient space (at least 10 cm) on both sides and at the back of the unit to allow adequate air circulation.

The KingFisher Flex does not produce operating noise at a level that would be harmful. No sound level measurements are required after installation.

Caution Do not operate the instrument in an environment where potentially damaging liquids or gases are present. ▲

Place the instrument on a normal laboratory bench. The net weight of the entire equipment is approx. 28 kg [62 lbs.].

The instrument operates at voltages of 100 – 240 Vac and the frequency range of 50/60 Hz.

Precautions and limitations

- Always ensure that the local supply voltage in the laboratory conforms to that specified on the type label on the back of the instrument (Figure 2–4).
- Do not smoke, eat or drink while using the KingFisher Flex.
- Wash your hands thoroughly after handling test fluids.
- Observe normal laboratory procedures for handling potentially dangerous samples.
- Wear proper protection clothing, such as disposable gloves and laboratory coats, according to good laboratory practice.
- Ensure that the working area is well ventilated.
- Never spill fluids in or on the equipment.

Caution The KingFisher Flex should not be kept in close proximity to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads.
Do not hold the KingFisher Flex heads close to a PC display, since this may cause damage to the display.
Do not use metal tools when handling KingFisher Flex heads. ▲

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field. ▲

Installation setups

This section describes the installation setups that you must carry out before operating or relocating the instrument.

Releasing the transport locks

The instrument comes with two transport locks (Figure 3–9): the tip comb holder transport lock and the heating block transport lock. Remove both the transport locks.

Make sure both the transport locks are released before you put the instrument into operation.

To remove both the transport locks, follow these steps:

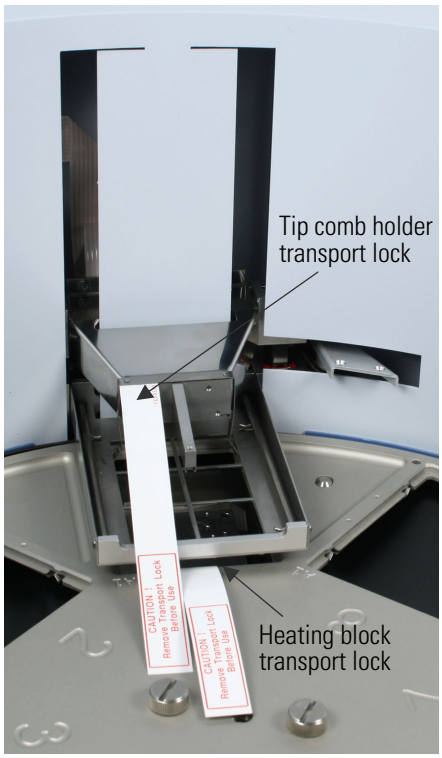


Figure 3–9. KingFisher Flex transport locks fitted

1. To remove the transport lock of the tip comb holder, take firmly hold of the lock and press tightly on both sides of the lock according to Figure 3–10 so that the lock ends are released. Keep hold of the tip comb holder and lock simultaneously and start gradually lifting the holder.

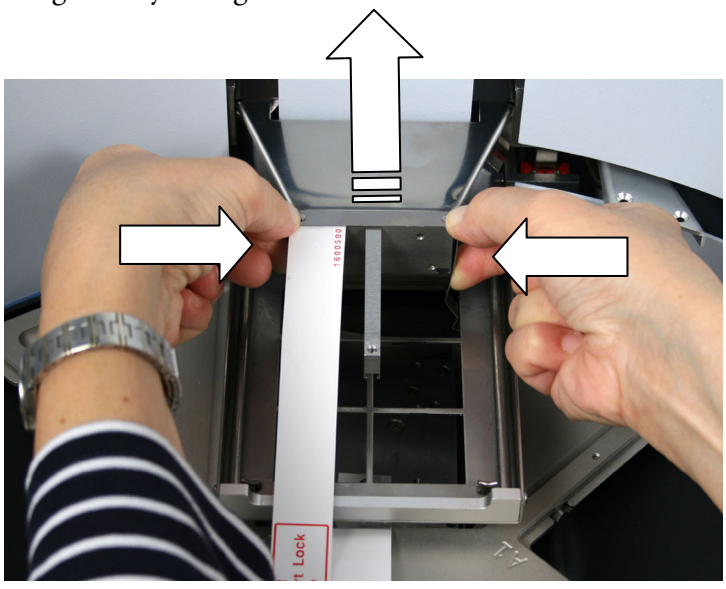


Figure 3–10. Removing the transport lock of the tip comb holder

2. Lift the tip comb holder higher and continue pressing the transport lock of the tip comb holder. Remove the transport lock from its

location by ejecting it from the two eccentric pins (Figure 3–11). When relocating the instrument, refer to “How to refit the transport lock of the tip comb holder” on page 36.

Figure 3–11. Tip comb holder transport lock removed

3. The transport lock of the heating block is removed according to Figure 3–12. Unscrew the transport lock screw counterclockwise (Figure 3–12). Lift the screw with the label attached (Figure 3–13).

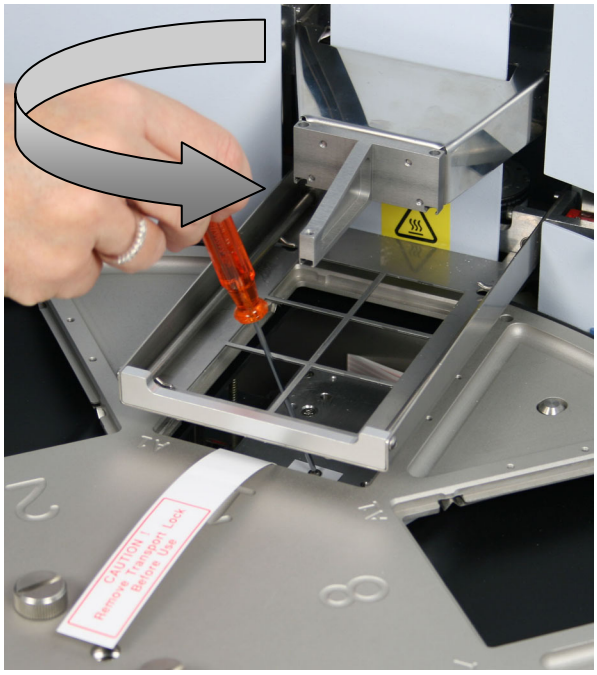


Figure 3–12. Removing the transport lock of the heating block (A)

4. Remove the transport lock screw from the label (Figure 3–13).

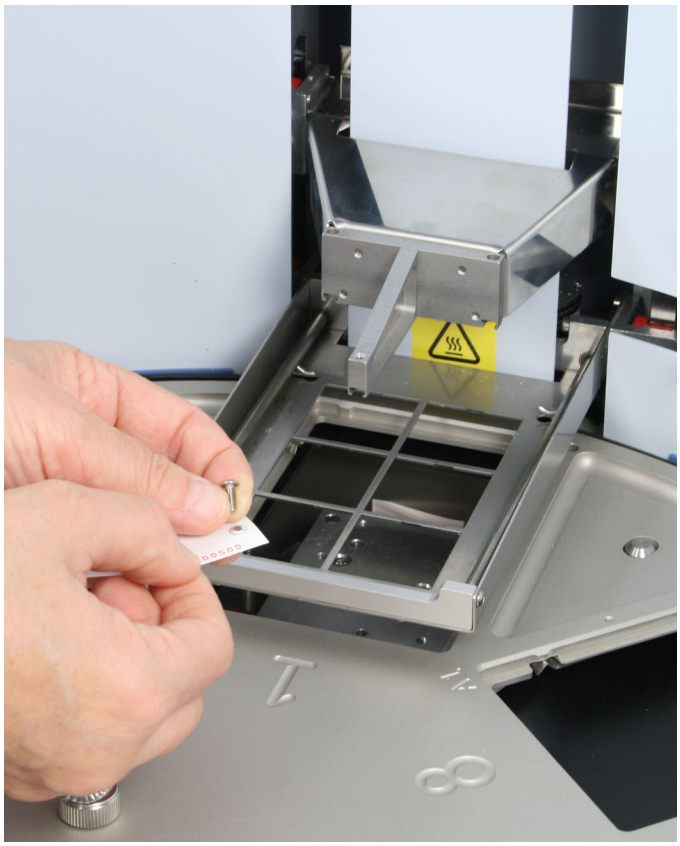


Figure 3–13. Removing the transport lock of the heating block (B)

5. Then fasten the screw clockwise to its storage site on the heating block base. The two screws on the heating block base guide the heating block into the correct position.

Note Keep the transport locks (Figure 3–11 and Figure 3–13) for future transportation of the instrument. ▲

Both the transport locks have been successfully removed. When relocating the instrument, refer to “How to refit the transport lock of the heating block” on page 35 and “How to refit the transport lock of the tip comb holder” on page 36.

How to ensure startup

1. Connect the mains supply cable to the mains power connector (Figure 3–14) at the bottom left of the back/side panel. If you need to use any other type of mains supply cable than supplied, use only cables certified by the local authorities. Before you plug in the power cable, ensure that the voltage on the type label at the bottom left of the back/side panel (Figure 2–4) corresponds to the local voltage.

2. Connect the instrument to a correctly installed line power outlet that has a protective conductor that is grounded.

Warning Ensure that the mains switch (Figure 2–4) on the bottom left of the back/side panel is in the OFF position. Never operate your instrument from a power outlet that has no ground connection. ▲

Caution Always connect or disconnect the serial cable when the power is off. ▲

Figure 3–14. Mains supply cable and serial cable connected

How to fit the subassemblies of the instrument into place

This section describes the installation setups of the heating block, shield plate, interchangeable KingFisher Flex heads and the see-through lid.

Heating block

Fastening/changing the heating block is controlled by the software. To fit the heating block, choose the Change_heatblock protocol under the **Maintenance** menu by using the up and down cursor keys. Then press **START**. The heating block will thus rise. Insert the heating block by first setting it and then pressing it hard into place (Figure 3–15 and Figure 3–16). The heating block will snap at both ends if you have done it correctly.

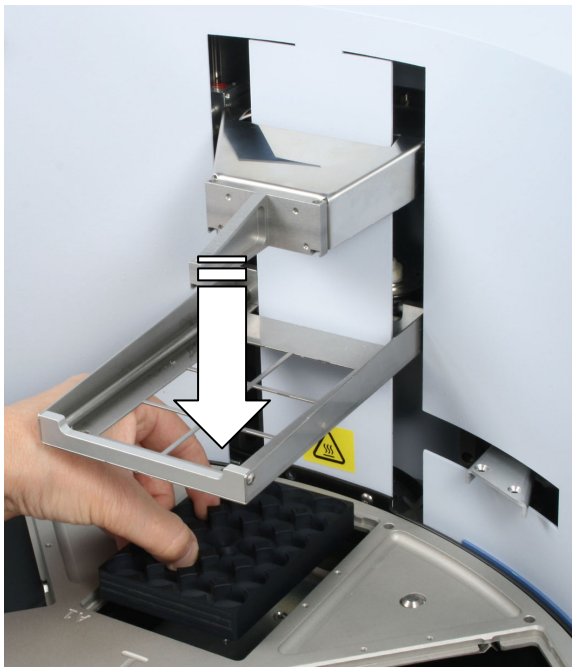


Figure 3–15. Inserting the heating block

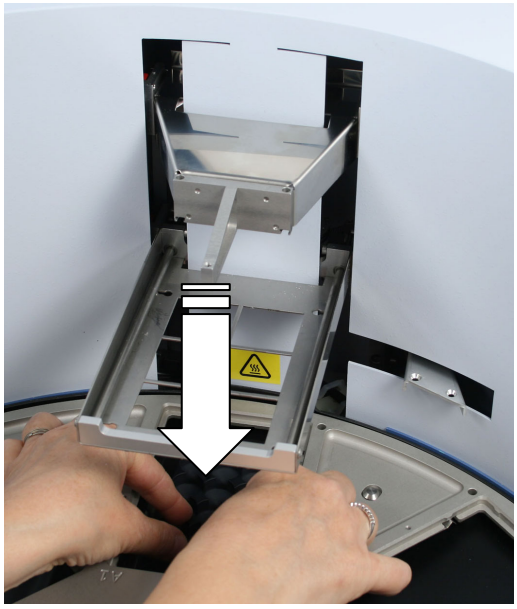


Figure 3–16. Pressing the heating block into place

You can add a heating step of ambient temperature +5°C to +115°C to a protocol. The heating block is preheatable but no cooling can be carried out. All KingFisher Flex plates can be heated.

There are four different kinds of interchangeable heating blocks available, for KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates (Table 3–1).

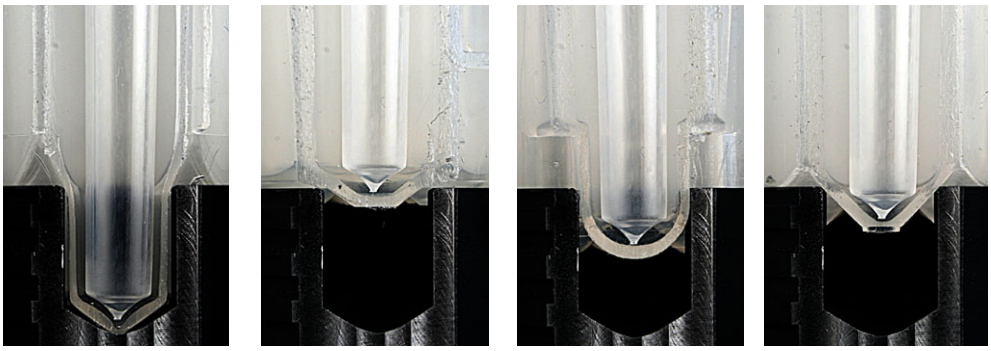
Table 3–1. Plates vs. heating adapter(s)

Plate	Description	Heating adapter(s)	Description
	KingFisher 24 deep well plate (200 µl – 5 mL*)		Heating block for KingFisher 24 deep well plate
	Microtiter deep well 96 plate (50 – 1000 µl*)		Heating block for Microtiter 96 deep well plate
	KingFisher 96 plate (20 – 200 µl*)		Heating block for KingFisher 96 plate
	PCR plate (20 – 100 µl*), skirted (for example, AB gene SuperPlate # AB-2800)		Heating block for PCR plate

* = recommended filling volume

Warning The heating block surface can be hot, whereby there can be risk of burns. ▲

Caution The heating block is specifically designed for the plates listed below to ensure even heating during the sample process (Figure 3–17). Using other plates than those recommended may damage the instrument and diminish the application performance. ▲



A B C D

Figure 3–17. Sectional view of the Microtiter deep well 96 plate (a), deep well 96 plates of other manufacturers (b, c, d) and the KingFisher Flex 96 deep well heating block

You can only use the following 24 and 96-well plates for heating:

- KingFisher 24 deep well plate (200 µl – 5 mL*)
- Microtiter deep well 96 plate (50 – 1000 µl*)
- KingFisher 96 plate (20 – 200 µl*)
- PCR plate (20 – 100 µl*), skirted

* = recommended filling volume

Shield plate

To install the shield plate, follow these steps:

1. Ensure that the power is switched OFF.

2. The shield plate has to be installed prior to use of the instrument. Use a hexagonal screwdriver (Allen key) to fasten the two screws (Figure 3–18).

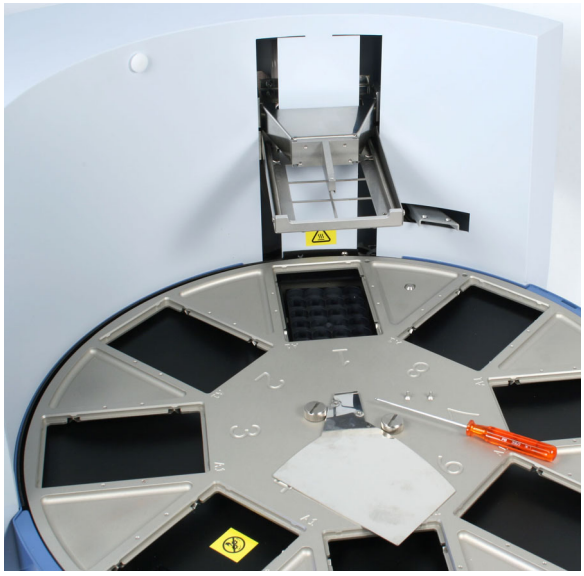


Figure 3–18. Shield plate prior to fitting

3. First insert the shield plate into its slot (Figure 3–19).

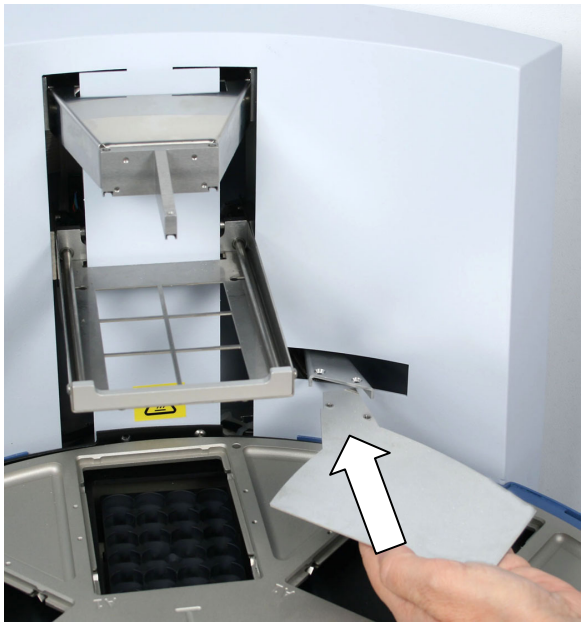


Figure 3–19. Inserting the shield plate

4. When fastening the two plate retaining screws (Figure 3–20), be careful not to drop them inside the instrument. Figure 3–21 shows the shield plate installed.

Figure 3–20. Fastening / loosening the shield plate

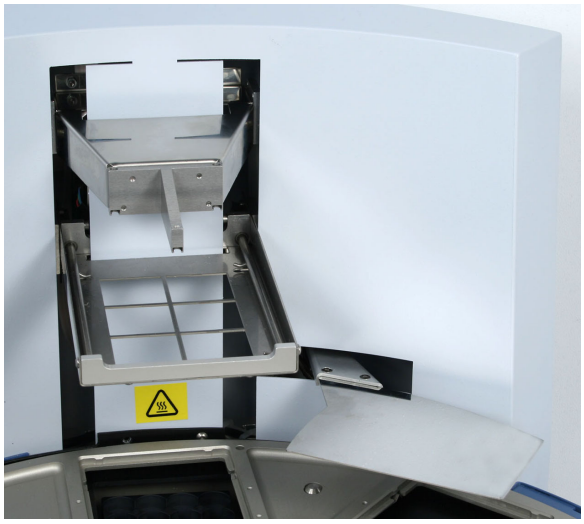


Figure 3–21. Shield plate fitted

Interchangeable KingFisher Flex heads

There are four kinds of interchangeable KingFisher Flex heads available, for KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates. The KingFisher Flex heads all have corresponding disposable plastic tip combs (Table 3–2). Note that KingFisher Flex heads do not fit into the KingFisher 96 and vice versa.

△ **Caution** Do not place the KingFisher Flex heads on top of the instrument or any metal surfaces.
Keep the KingFisher Flex heads always in their respective plastic boxes when not in use.
It is very important to keep the KingFisher Flex heads away from each other and other magnets at all times. Clashing of the magnets together may cause serious damage to the magnets. ▲

Table 3–2. Magnetic head vs. tip comb

Magnetic head	Description	Tip comb	Description
	KingFisher Flex head for KingFisher 24 deep well plate		Tip comb for KingFisher 24 deep well plate
	KingFisher Flex head for Microtiter deep well 96 plate		Tip comb for Microtiter deep well 96 plate
	KingFisher Flex head for KingFisher 96 plate		Tip comb for KingFisher 96 plate
	KingFisher Flex head for PCR plate		Tip comb for PCR plate

When not in use, keep the KingFisher Flex heads always in their respective plastic storage boxes (Figure 3–22).

Figure 3–22. KingFisher Flex heads in their storage boxes

Caution The KingFisher Flex should not be kept in close proximity to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads.
Do not hold the KingFisher Flex heads close to a PC display, since this may cause damage to the display.
Do not use metal tools when handling KingFisher Flex heads. ▲

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field. ▲

To insert KingFisher Flex heads, choose the Change_magnet protocol under the **Maintenance** menu by using the up and down cursor keys. Then press **START**. Insert the KingFisher Flex head so that the three pins (shown with black arrows) slot into place (Figure 3–23 and Figure 3–24). When you remove the KingFisher Flex head, be careful not to damage the magnet rods against the tip comb holder frame.

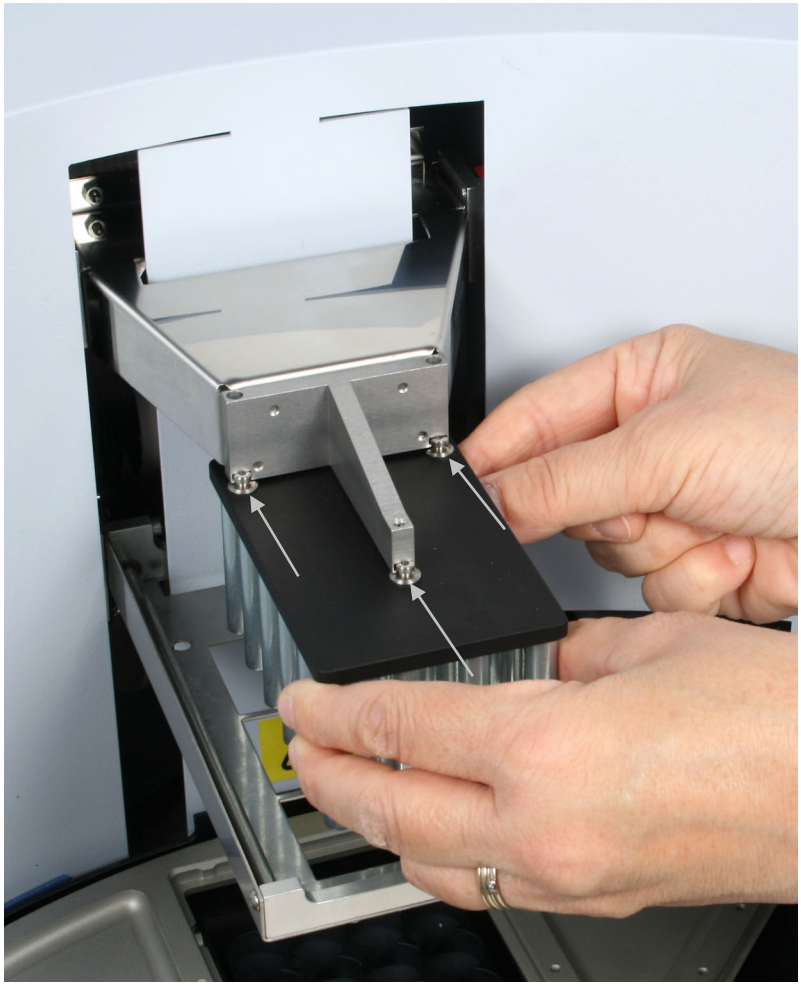


Figure 3–23. Inserting the KingFisher Flex head

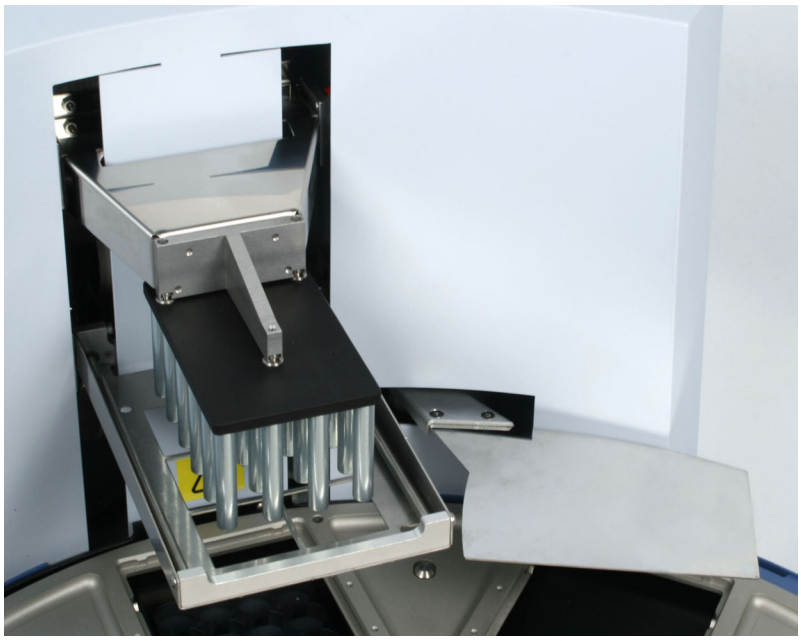


Figure 3–24. KingFisher Flex head for KingFisher 24 deep well plate fitted

See-through lid

During operation, the sliding door can be open or closed or the whole see-through lid can be absent (Figure 3–25). The closed door protects the processing against environmental contamination.

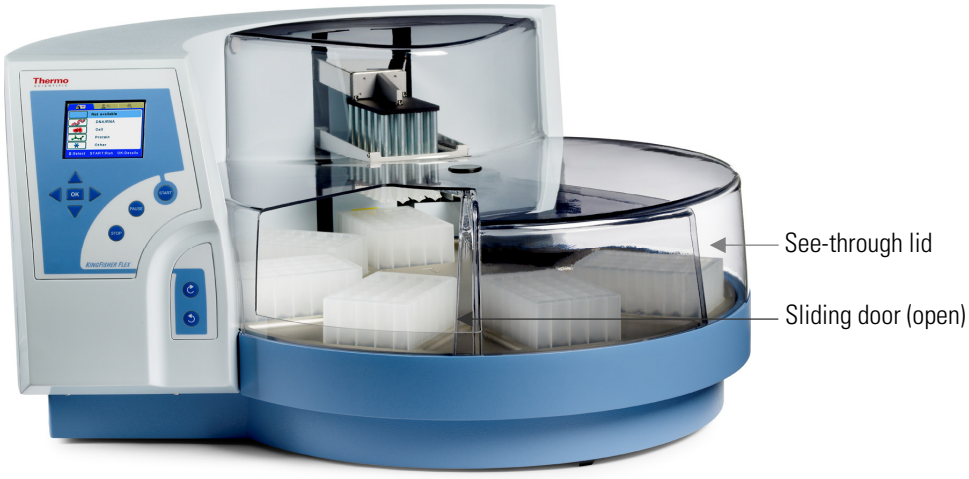


Figure 3–25. See-through lid fitted

Operational check

First switch the instrument ON. The instrument performs initialization tests and adjustments.

The display quickly shows the internal software version. This happens when the initialization tests and adjustments have been completed.

It is recommended that you carry out a check run using a demo protocol to verify proper instrument operation. Run the check protocol (Check_96dw_tip, Check_KF96_tip, Check_pcr_tip, or Check_24dw_tip) under the **Maintenance** menu according to the KingFisher Flex head and plastics you are using. If the check is all right, proceed with your own runs.

How to pack the instrument for transportation

This section describes how to refit both the transport locks, the transport lock of the heating block and that of the tip comb holder.

How to refit the transport lock of the heating block

To refit the transport lock of the heating block, follow these steps:

1. Remove the heating block in the following way:
   - First choose the Change_heatblock protocol.
   - Then press **START**.
   - Remove the heating block by pulling it out.
   - Press the **START** key when the task has been completed.
2. Switch off the power.
3. Take the transport lock screw from its storage site.
4. Insert the transport lock screw into the label and refit the transport lock of the heating block into its place (Figure 3–26).

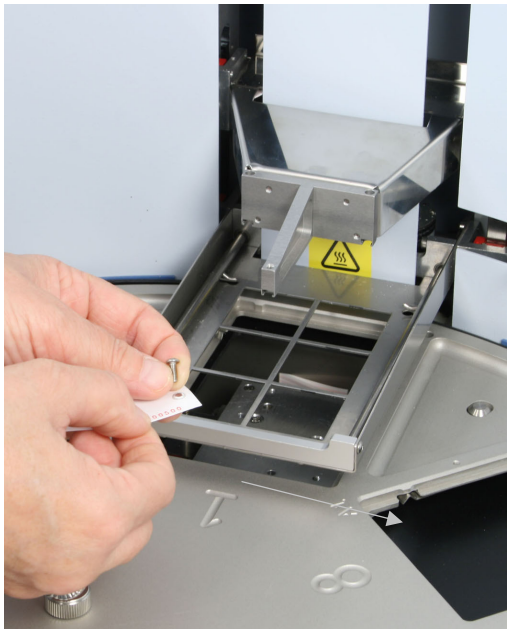


Figure 3–26. Refitting the transport lock of the heating block (A)

5. The transport lock of the heating block is refitted according to Figure 3–27. Screw the transport lock screw clockwise (Figure 3–27). Figure 3–30 shows both the transport locks refitted.

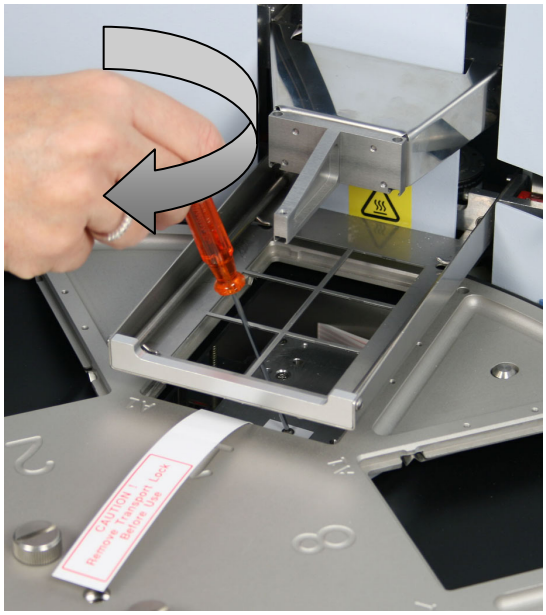


Figure 3–27. Refitting the transport lock of the heating block (B)

How to refit the transport lock of the tip comb holder

To refit the transport lock of the tip comb holder, follow these steps:

1. The transport lock of the tip comb holder is refitted according to Figure 3–28 through Figure 3–29. Press the transport lock from both sides and insert the two eccentric pins back into place into their respective holes (Figure 3–28).

Caution Ensure that the power is switched off. ▲

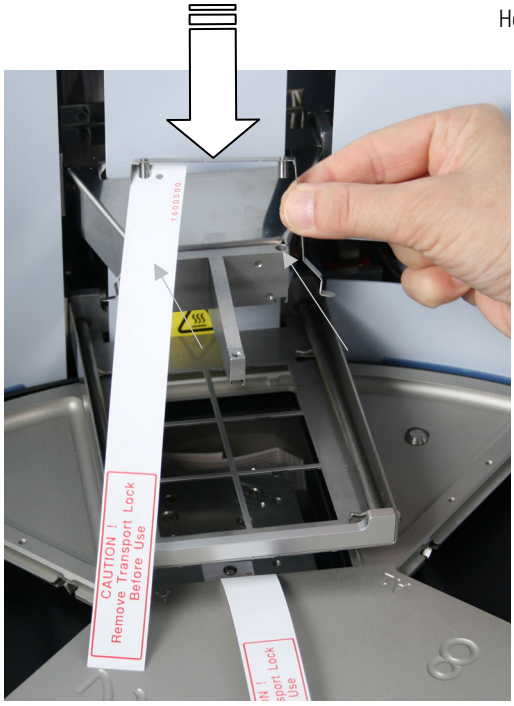


Figure 3–28. Fitting the transport lock of the tip comb holder (A)

2. Press the tip comb holder transport lock ends together with both hands and insert all the way down to lock position (Figure 3–29). Note that the turntable can move slightly although the transport lock is fitted.

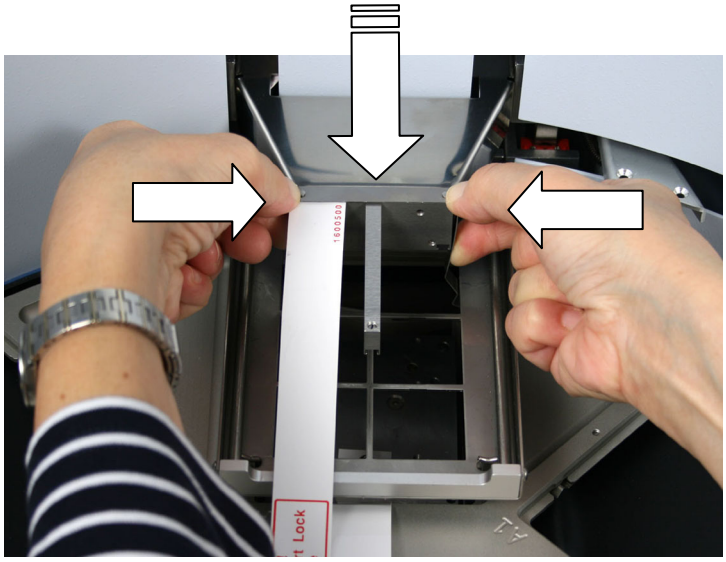


Figure 3–29. Fitting the transport lock of the tip comb holder (B)

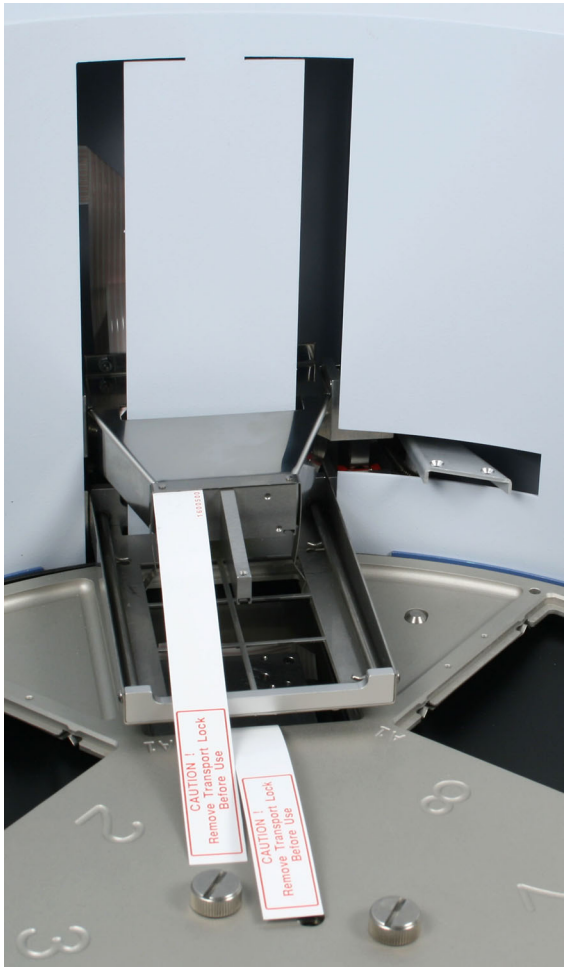


Figure 3–30. Both transport locks refitted

Figure 3–30 shows both the transport lock of the heating block and the tip comb holder refitted.

Chapter 4
Routine Operation

Do's and Don'ts of the KingFisher Flex

This section on Do's and Don'ts summarizes all the relevant procedures on what to do and what not to do.

Do

- In case of any emergencies occurring during operation, switch off and unplug the instrument immediately. Carry out corrective measures. If the corrective measures taken do not help, contact authorized technical service.
- Carry out the operational check prior to normal use.
- Only when the instrument is switched off, can you push the heads or turn the turntable manually.
- When placing a microplate onto the tray, always make sure that the correct plate type has been selected in BindIt Software (Plate Editor > **Plate Configuration…**) before you do anything else.
- Always use correct volumes on the plates because the movements of the tip comb are conducted according to the volumes.

Don't

- Use for self-testing is excluded.
- Do not touch or loosen any screws or parts other than those specifically designated in the instructions. Doing so might cause misalignment and will invalidate the instrument warranty.
- Never open any other cover of the KingFisher Flex than the see-through lid or the sliding door (Figure 2–3) while the instrument is plugged into a power source.
- Do not disconnect the RS-232C or USB cable before the PC and the instrument are switched off.
- Do not use the instrument if it appears that it does not function properly.
- Do not under any circumstances use formaldehyde.
- Do not spill any alkalines onto any instrument surfaces to avoid damage of the instrument. If needed, use suitable protection covering.

Switching on

Before you switch on the KingFisher Flex, ensure that the voltage on the type label at the bottom left of the back/side panel (Figure 2–4) corresponds to the local voltage.

Warning Never operate your instrument from a power outlet that has no ground connection. ▲

Control panel

This section describes the KingFisher Flex control panel and internal software.

Keyboard

The keyboard is shown in Figure 4–31.

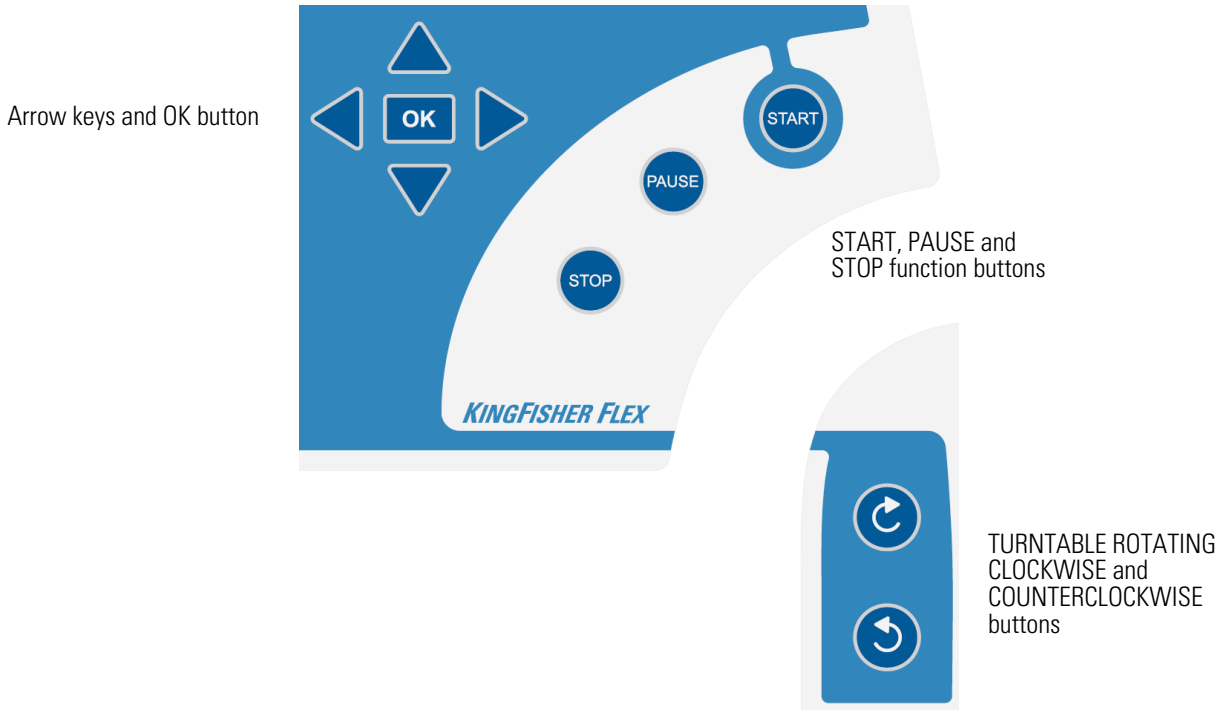


Figure 4–31. Keyboard of the KingFisher Flex

Keys

The relevant keys and control buttons are described in detail below.

The arrow keys are used to select the next protocol and to navigate in the display.

To accept the selection.

To initiate the run.

To confirm a performed step in the protocol, for example, plate loading or removal.

To pause/terminate the processing step. In short:

STOP (paused)/ **START** (the instrument continues after a Pause step)

STOP (paused)/ **STOP** (the processing is terminated).

To pause the run. It will pause at the end of the ongoing processing step.

To rotate the turntable clockwise (**TURNTABLE ROTATING CLOCKWISE** button).

To rotate the turntable counterclockwise (**TURNTABLE ROTATING COUNTERCLOCKWISE** button).

Display

The liquid crystal display is a 240 x 360 pixel display.

The main view in the display is shown in Figure 4–32.

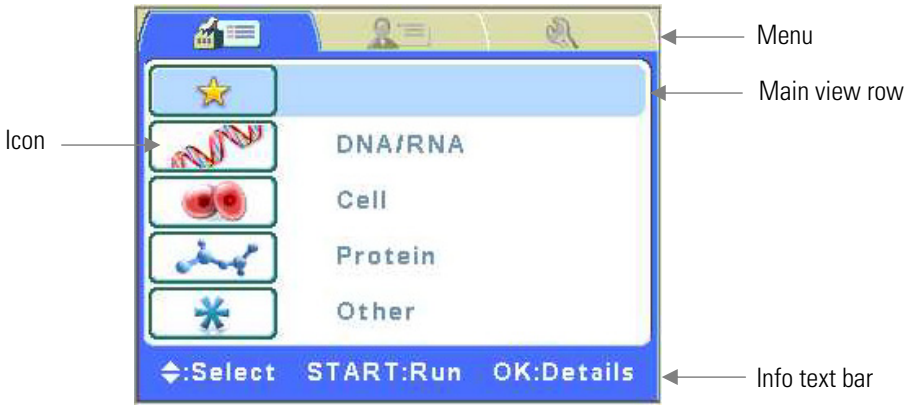


Figure 4–32. Main view on the display of the KingFisher Flex

There are three *menus* in the KingFisher Flex user interface: **Factory protocols**, **User protocols** and **Maintenance**. In routine use you mainly navigate in the **Factory/User protocols** menu. In advanced level options there is one extra menu, **Maintenance**. You can navigate between these three menus using the **Left** and **Right** arrow keys.

The *main view row* is either colored (active) or uncolored/different colored (inactive).

All the descriptive *icons* used in the main view are shown in Table 4–3 below.

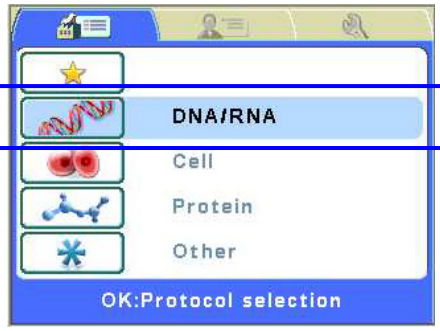
The *info text bar* shows explanatory information on how to proceed and which keys to use.

Navigating

This section visualizes navigation in the KingFisher Flex user interface.

The main view changes according to the selections you make either with the **Up** or **Down** arrow keys or the **OK** button. The available buttons and their function are shown on the info text bar.

Active item



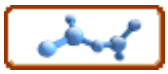
The color of the items, for example, the icon and main view row, in the main view changes when they are selected (active/inactive).

To move from one menu to another, make sure you are in the main view of one of the menus and use the **Left** and **Right** arrow keys.

The main views of each menu tab are shown below.

Factory protocols | User protocols | Maintenance

Table 4–3. Icons in the main view

Menu	Icon	Function
	Last used / Default	"Setting the default protocol" on page 45
		"Selecting the protocol" on page 44 DNA/RNA
		Cell
		Protein
		Other
	Last used / Default	"Setting the default protocol" on page 45
		"Selecting the protocol" on page 44 DNA/RNA
		Cell
		Protein
		Other
		"Device information" on page 47
		"Computer interface" on page 48
		"Language" on page 48
		"Buzzer" on page 49
		"Maintenance protocol" on page 50

Using KingFisher Flex PC software

The operation of the KingFisher Flex magnetic particle processor can also be controlled by an external computer and run on BindIt Software. In addition to the KingFisher Flex internal software features, you can also download protocols to the instrument or back up protocols from one instrument and transfer them to another.

For more information, refer to the *BindIt Software User Manual* (Cat. no. N07974).

Using internal software

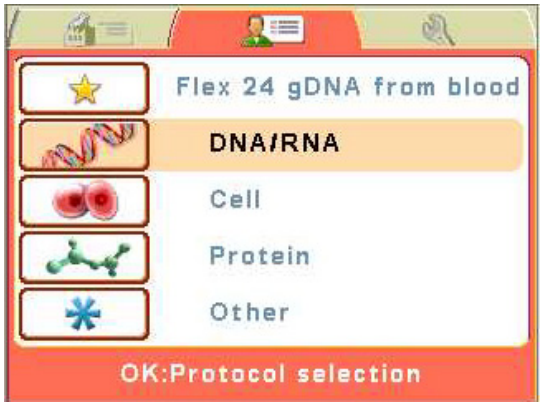
This section describes procedures related to the KingFisher Flex internal software.

Factory / User protocols

This section describes the factory/user set protocols. They are found in the **Factory protocols/User protocols** menu. Factory protocols are protocols which are preloaded into the instrument internal memory in the factory, for example, demo protocols. User protocols are protocols which are made and transferred using BindIt Software.

Selecting the protocol

Go to the **Factory protocols/User protocols** menu. Select, for example, the **DNA/RNA** row.

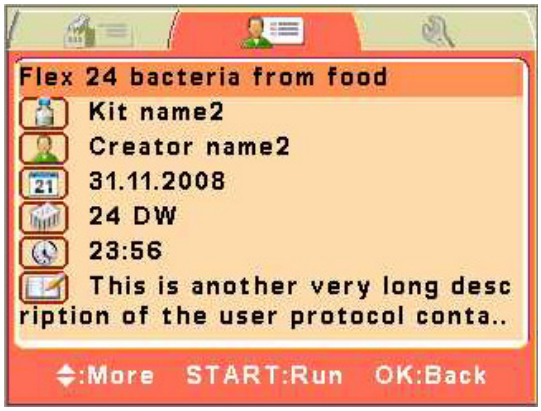


Press **OK**.

Use the **Up** and **Down** arrow keys to select the protocol.

Press **START** to run the protocol.

Press **OK** to see the protocol details.



Setting the default protocol

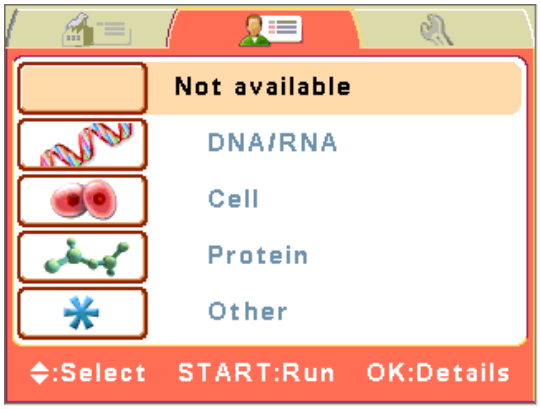
Go to the **Factory protocols/User protocols** menu. You can set your default protocol. If you do not, the last used protocol will be shown.

To set the default protocol, go to the protocol list **Last used/Default protocol** row.

Last used

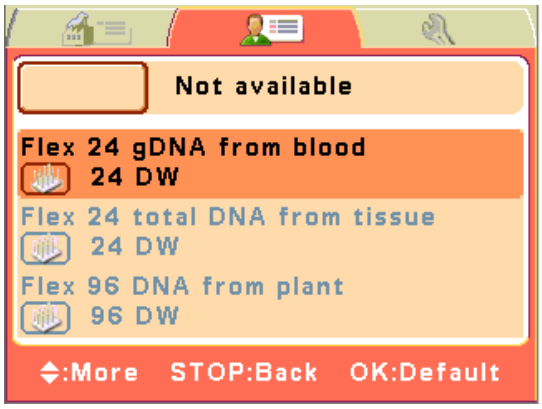
/

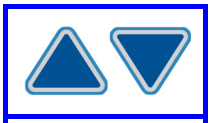
Default



Press **OK** to start setting your default protocol.

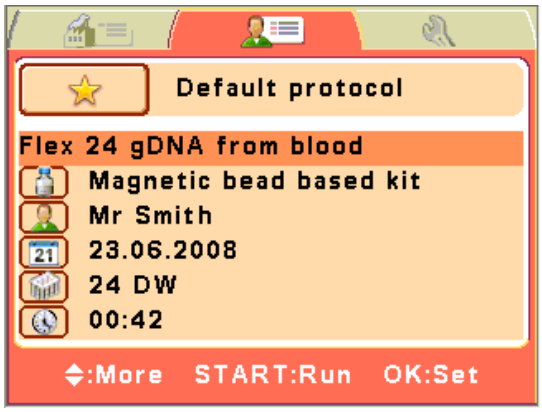
Press **OK** to select your default protocol.



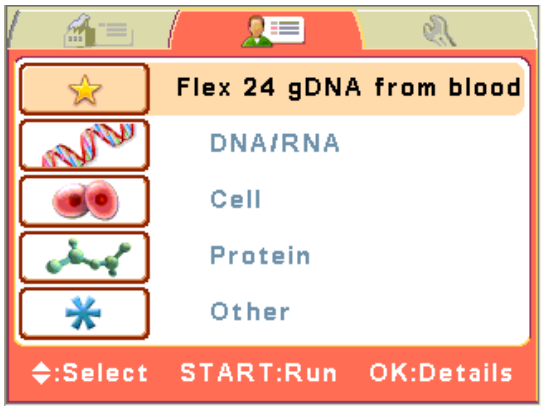


Use the **Up** and **Down** arrow keys to select the protocol.

Press **OK** to set the default protocol.



Press **STOP** to go back.



Instrument options

This section describes the instrument parameters. All these parameters are set in the **Maintenance** menu. The values shown in the **Maintenance** menu remain in the instrument memory and are instrument specific, not protocol specific.

Device information

The device information shows the name of the instrument, the internal software version and the serial number of the instrument unit.

Go to the **Maintenance** menu.

Press **OK**.

Press **OK** to exit.

Computer interface

There are two types of computer interfaces available: RS-232 and USB.

The instrument will automatically connect to the interface that is first used after the power is switched on.

Go to the **Maintenance** menu. Select the **Computer interface** row.

Press **OK**.

This selection also has to be done when you use the instrument through BindIt Software. Refer to Chapter 2: “Installing the Software” in the *BindIt Software User Manual* (Cat. no. N07974).

Use the **Up** and **Down** arrow keys to select the computer interface in use. *Not active* will reset the computer interfaces.

Press **OK**.

Language

You can set the language of the internal software.

Go to the **Maintenance** menu. Select the **Language selection** row.

OK Press **OK**.

Use the **Up** and **Down** arrow keys to select the language in use. The available languages are *English*, *Deutsch*, *Français*, *Español* and *Portuguese*. The default language is *English*.

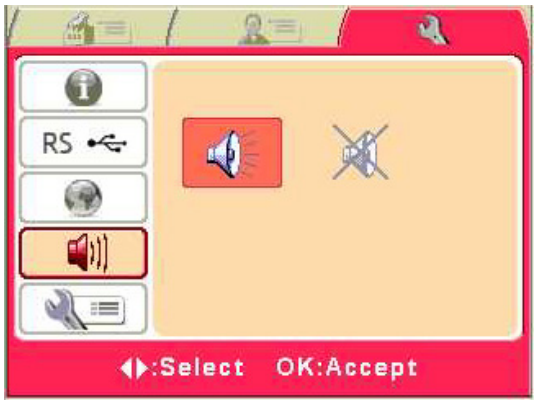
OK Press **OK**.

Buzzer

You can choose whether or not the instrument produces a sound for different functions. Note that all functions make a certain sound.

Go to the **Maintenance** menu. Select the **Buzzer on/off** row.

Press **OK**.



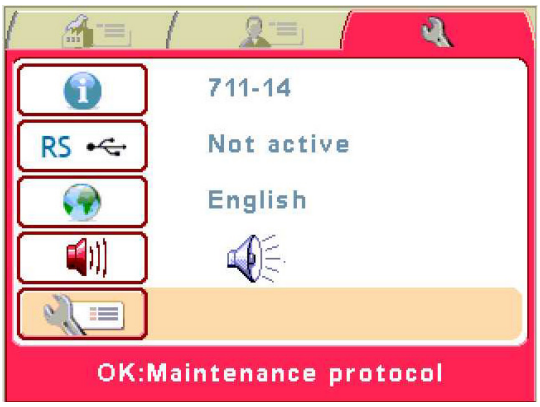
Use the **Left** and **Right** arrow keys to select whether the buzzer (audible sound) is On or Off.

Press **OK**.

Maintenance protocol

You can set which protocol is automatically selected as the maintenance protocol when the KingFisher Flex is powered on.

Go to the **Maintenance** menu. Select the **Maintenance protocol** row.



Press **OK**. All available maintenance protocols will be displayed.

Use the **Up** and **Down** arrow keys to select the maintenance protocol.

Press **START** to run the desired protocol.

Press **OK** to go back.

How to handle tip combs

To handle 96 deep well tip combs correctly, follow these steps:

1. Take a 96 deep well tip comb package containing two tip combs (Figure 4–33).

Figure 4–33. Tip comb package with two tip combs

2. Unpack the package by separating the two tip combs (Figure 4–34) and placing one of the tip combs onto the KingFisher 96 plate (= tip-plate) (Figure 4–38 and Figure 4–39).

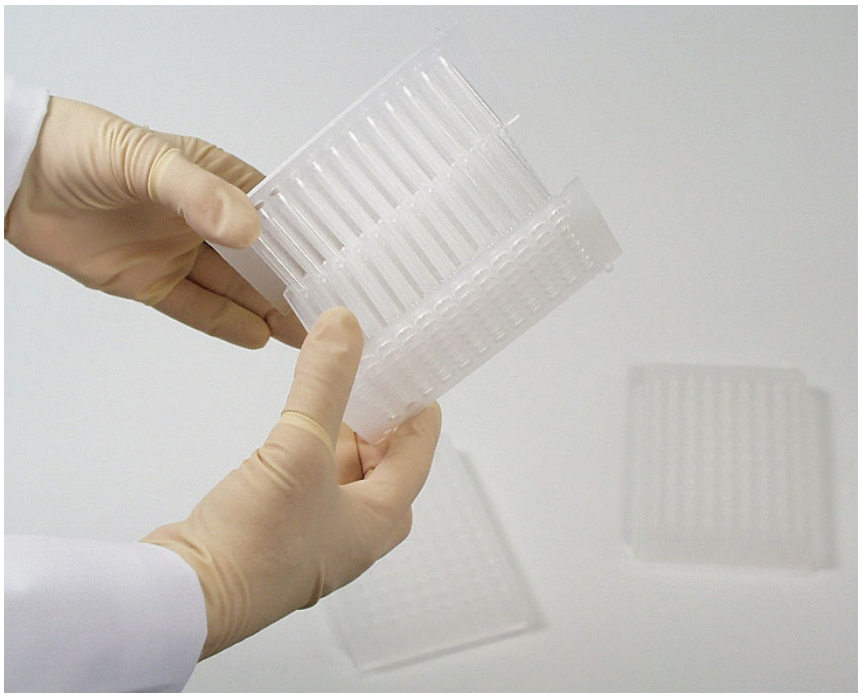


Figure 4–34. Separating the two tip combs

3. Place the other unused tip comb onto another plate for storage to avoid bending of the tip combs (Figure 4–35) to ensure proper instrument operation.

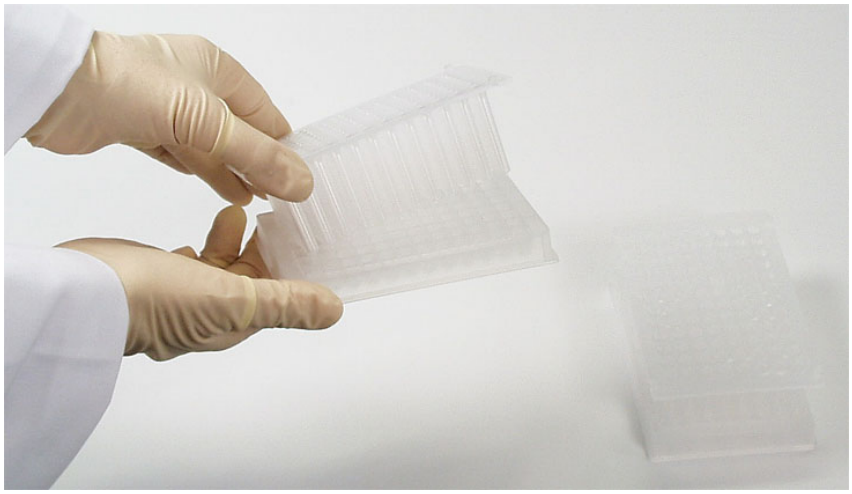


Figure 4–35. Storing the other tip comb on a KingFisher 96 plate for further use

To handle PCR tip combs correctly, follow these steps.

1. Take a PCR tip comb package containing eight tip combs within each other on a screen plate (Figure 4–36).

Figure 4–36. PCR tip comb package

2. Unpack the package, take out one PCR tip comb and place it on a KingFisher plate.

If the tip combs do not load properly, refer to *Q16* on page 77.

To handle 24 deep well tip combs correctly, follow these steps:

1. Take a 24 deep well tip comb package where the unattached tip comb is packed onto a KingFisher 24 deep well plate (Figure 4–37).

Figure 4–37. 24 deep well tip comb package

2. Unpack the package.

3. Before you take the tip comb into use, press the tip comb evenly against the enclosed 24 deep well plate with the aid of a magnetic head or another object.

How to start

To start the instrument, follow these steps:

1. Select a protocol by using the cursor keys and press **START** OR use BindIt Software to run the desired protocol via the PC.

2. Open the sliding door if the see-through lid is in place (Figure 2–3).

3. Load the plates in the order that the protocol requests (Figure 4–40 through Figure 4–42). Place the A1 well of the plate so that it is in the upper right corner. The first A1 row is consequently always in the inner circle. Once you have loaded the requested plates into the plate stations, press **START**. The tip comb always has to be placed manually onto a KingFisher plate (Figure 4–38 through Figure 4–40). The instrument also functions with either one plate or up to eight plates depending on the amount of steps. **Only one tip comb is placed onto a KingFisher plate (= tip-plate) per run** (Figure 4–39). Confirm the plate loading by pressing **START**.

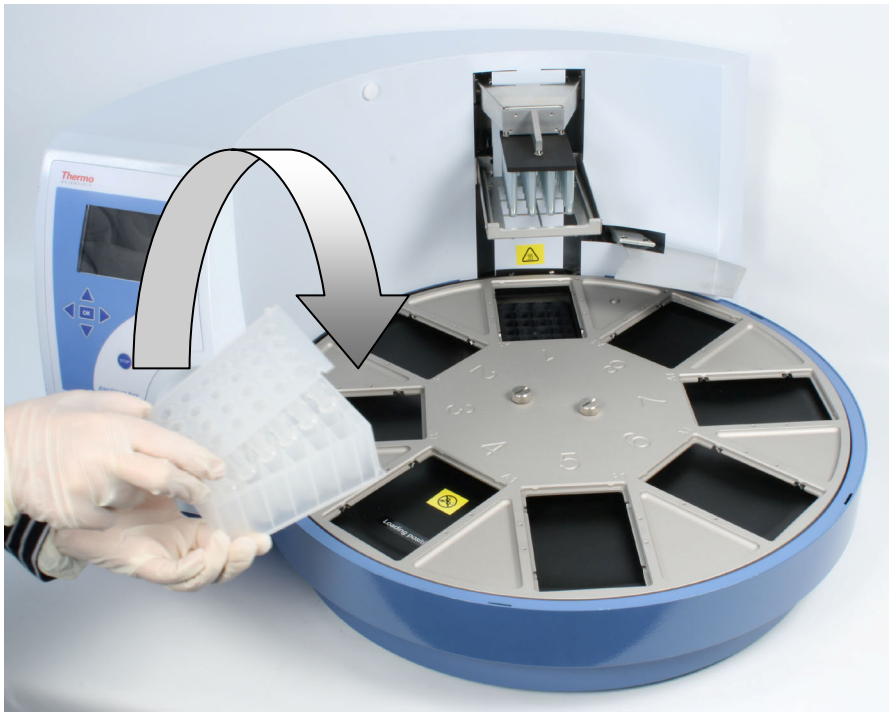


Figure 4–38. Combining the tip comb and KingFisher plate (A)

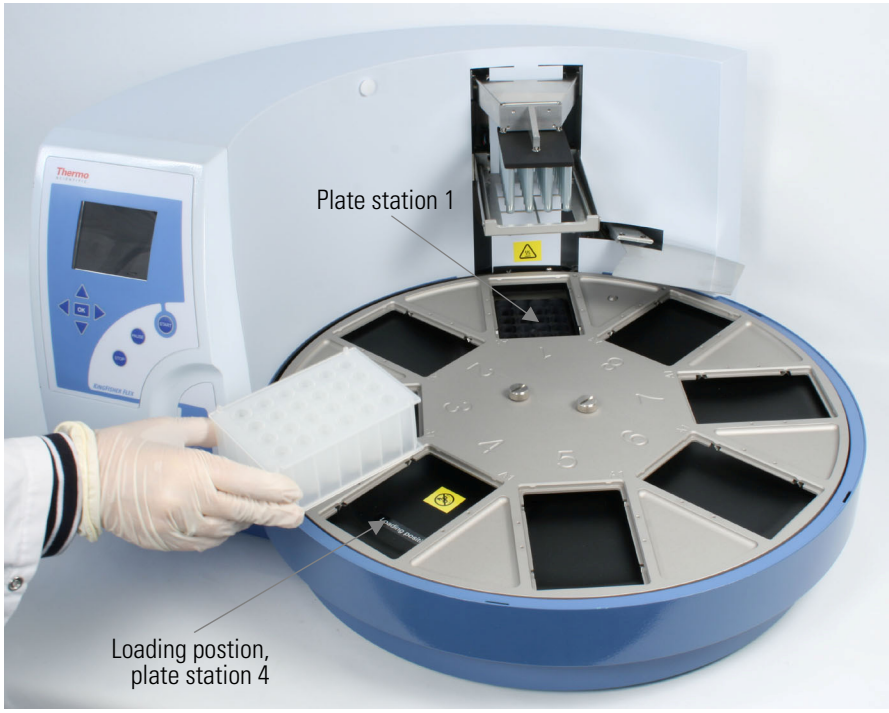


Figure 4–39. Combining the tip comb and KingFisher plate (B)

The loading position, that is, plate station 4, is labeled. The eight plate stations and the A1 positions of the eight plate stations are clearly marked on the turntable. When the instrument is in its basic position, plate station 1 is under the KingFisher Flex head. After the protocol has been run, note that the turntable may stop in a different position than the basic position.

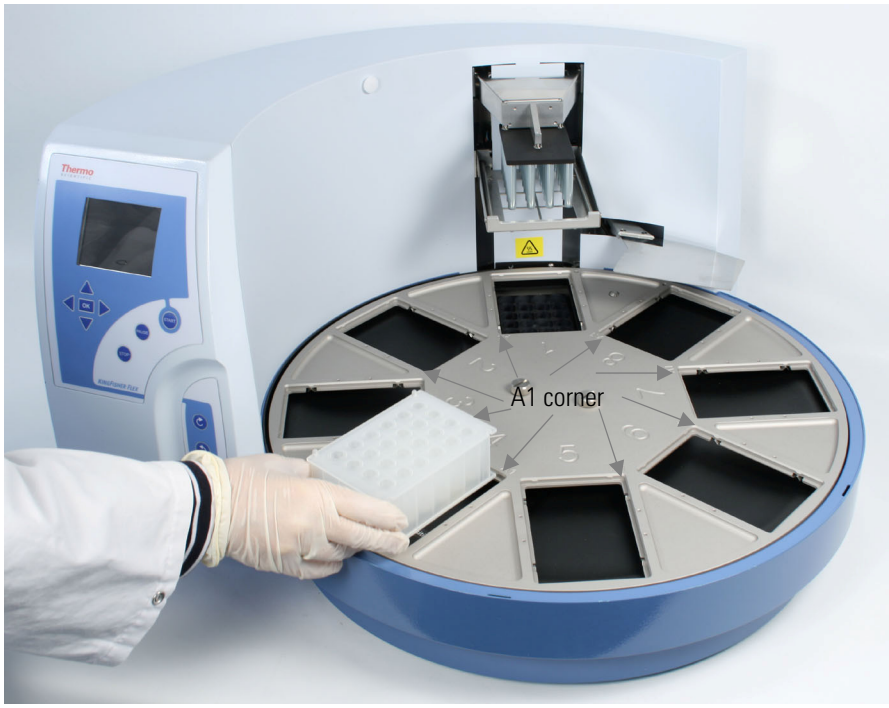


Figure 4–40. Loading the tip-plate

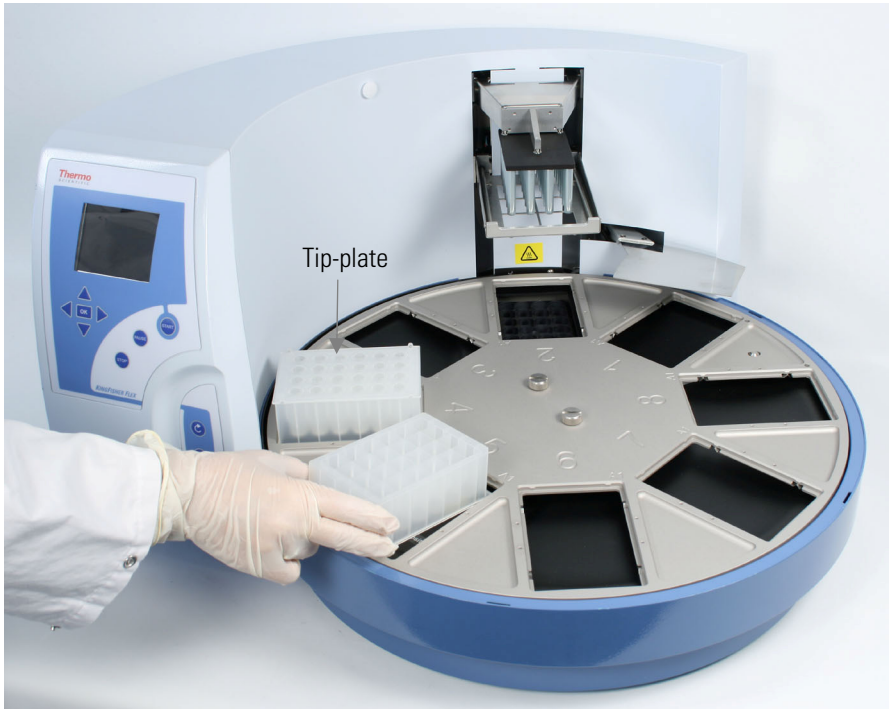


Figure 4–41. Loading the plates

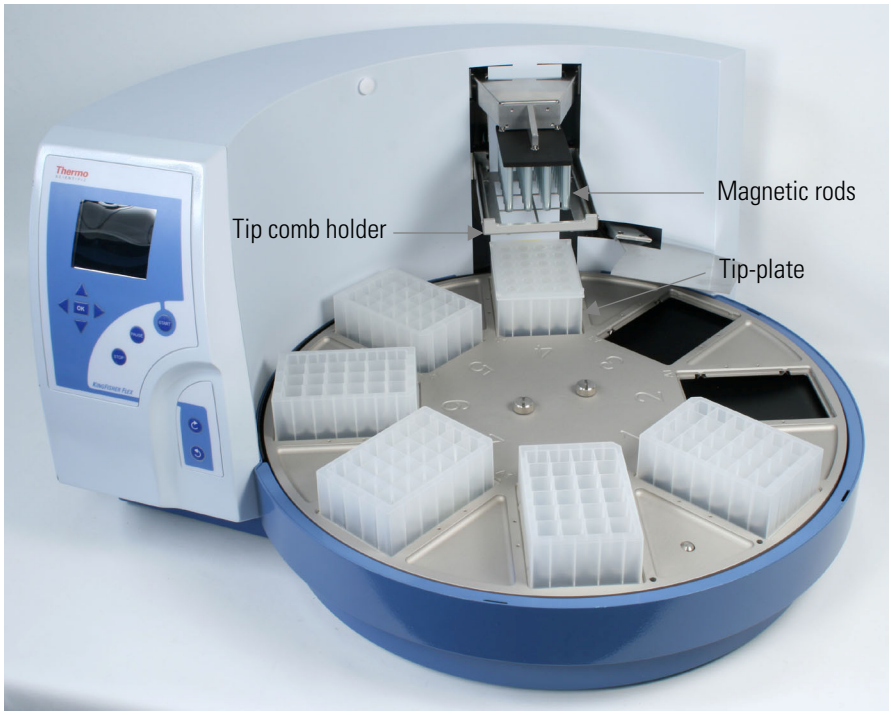


Figure 4–42. Plates loaded

4. The tip comb is automatically locked onto the tip comb holder from the tip-plate (Figure 4–43).

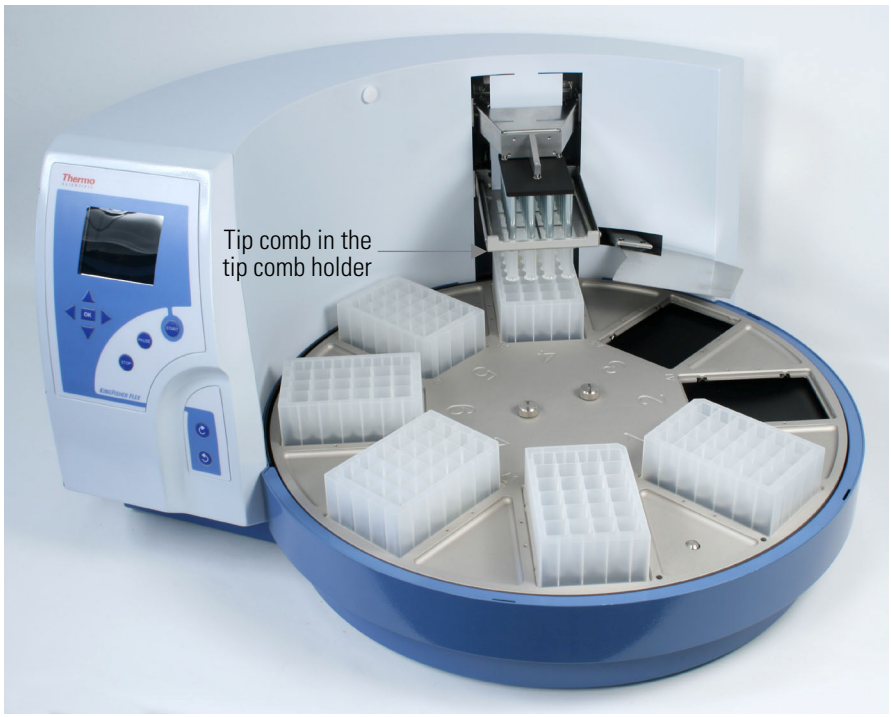


Figure 4–43. Tip comb in the tip comb holder

5. When the turntable moves, the shield plate moves over the plate underneath (Figure 4–44) forming a protective cover.

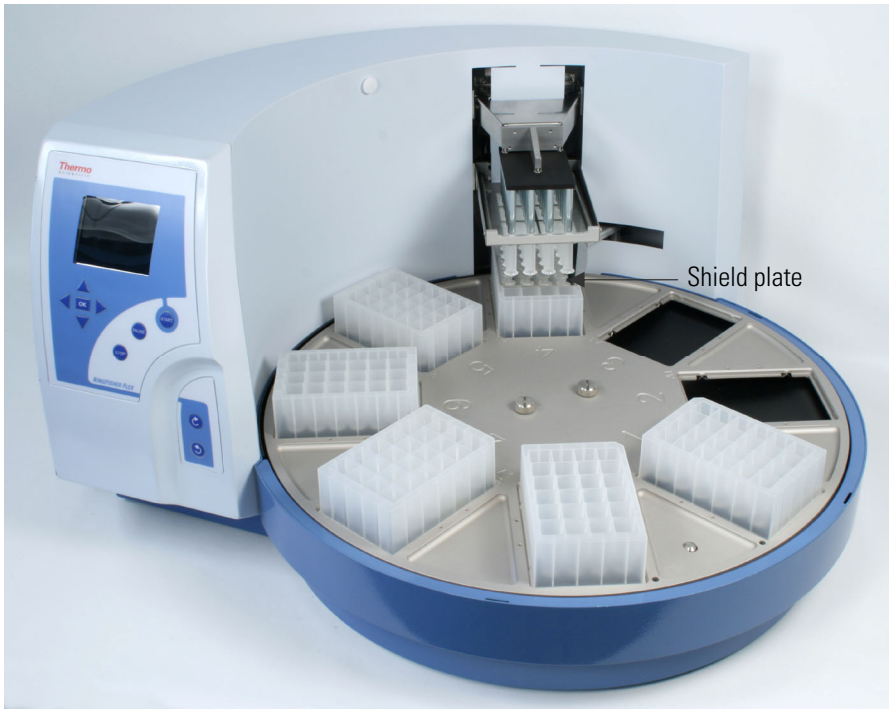


Figure 4–44. Shield plate in function

6. Close the sliding door. The see-through lid (if in place) protects the instrument against environmental contamination.

Note The sliding door can be left open or the see-through lid can be absent if desired. This action does not break the run. ▲

7. After the run, remove the plate(s) according to the protocol request. Confirm each plate removal by pressing the **START** key. Note that the plate containing your samples is removed first.

8. Press the **STOP** key after completing the run.

For startup, refer to "Switching on" on page 40.

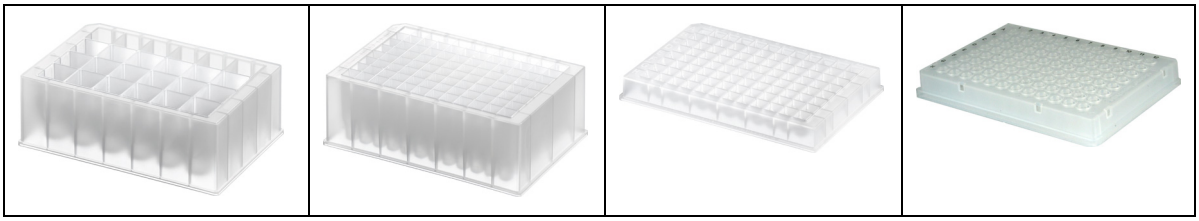


Figure 4–45. KingFisher Flex plates

Caution Do not use other plates than the ones listed in Table 4–4. Other plates may not be compatible with the KingFisher Flex heating blocks. They may also cause unexpected problems, such as cross-contamination due to the divergent well volume and bottom height of the plate. ▲

The KingFisher Flex is compatible with KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates (Figure 4–45 and Table 4–4). Specially designed magnetic rods (KingFisher Flex heads) and tip combs that protect the magnets during the process are available for different plate types and applications.

Table 4–4. Processing volumes vs. plate types and magnetic heads

Head / Plate	KingFisher 24 deep well plate	Microtiter deep well 96 plate	KingFisher 96 plate	PCR plate, skirted
KingFisher Flex head for KF 24 deep well plate	200 – 5000 µl	–	–	–
KingFisher Flex head for Microtiter deep well 96 plate	–	50 – 1000 µl	50 – 150 µl	–
KingFisher Flex head for KF 96 plate	–	–	20 – 200 µl	–
KingFisher Flex head for PCR plate	–	–	20 – 200 µl	20 – 100 µl

Changing the heating block

Changing the heating block is controlled by the software. To change the heating block, choose the Change_heatblock protocol by using the up and down cursor keys. Then press **START**. The protocol requests you to remove the magnets and in the end to insert them. The heating block will thus rise. Remove the heating block and then replace it

(Figure 4–46 and Figure 4–47). Insert the heating block by first setting it and then pressing it hard into place. The heating block will snap at both ends if you have done it correctly. Press the **START** key when the task has been completed.

Figure 4–46. Inserting the heating block

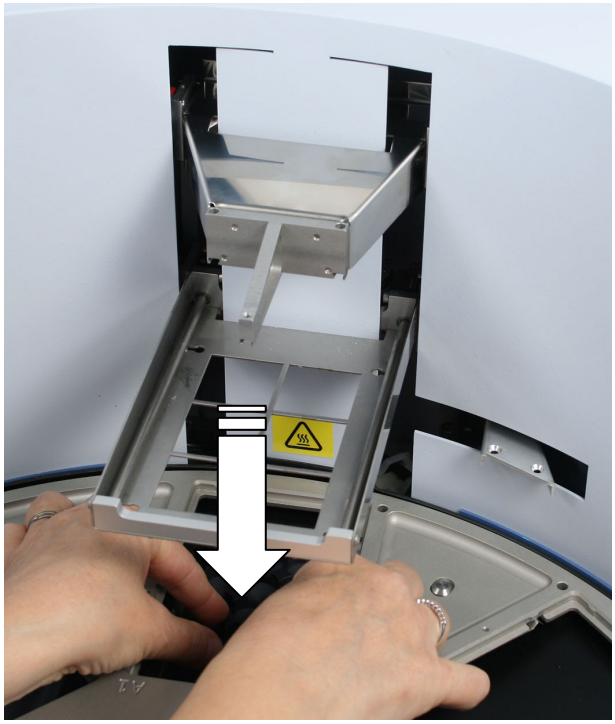


Figure 4–47. Pressing the heating block into place

You can add a heating step of ambient temperature +5°C to +96°C to a protocol. The heating block is preheatable but no cooling can be carried out. All KingFisher Flex plates can be heated.

There are four different kinds of interchangeable heating blocks available, for KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates (Figure 4–48 and Table 4–5).

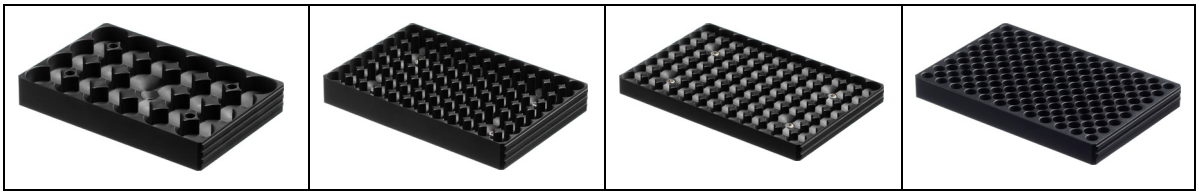


Figure 4–48. Four different heating blocks available

Table 4–5. Heating blocks vs. plate types

Heating block / Plate	KingFisher 24 deep well plate	Microtiter deep well 96 plate	KingFisher 96 plate	PCR plate, skirted
Heating block for KingFisher 24 deep well plate	x	–	–	–
Heating block for Microtiter deep well 96 plate	–	x	–	–
Heating block for KingFisher 96 plate	–	x	x	–
Heating block for PCR plate	–	–	–	x

Warning The heating block surface can be hot, whereby there can be risk of burns. ▲

Caution The heating block is specifically designed for the plates listed below to ensure even heating during the sample process (

Figure **3–17**). Using other plates than those recommended may damage the instrument and diminish the application performance. ▲

Shutdown

To shut down the KingFisher Flex, follow the steps below:

1. Switch the KingFisher Flex off by pressing the power switch (Figure 2–4) at the bottom left of the back/side panel of the instrument into the OFF position.

Warning Discard the plastic tip comb onto the plate. Dispose of all tip combs as biohazardous waste.
Remove any plates still in the instrument. Dispose of all microplates as biohazardous waste. ▲

2. Wipe the turntable surface and the adjacent instrument surface with a soft cloth or tissue paper moistened with distilled water, a mild detergent (SDS, sodium dodecyl sulfate) or soap solution.

3. If you have spilt infectious agents on the turntable, disinfect with 70% ethanol or another disinfectant (see "Decontamination procedure" on page 66).

Emergency situations

In case there is any abnormal situation during operation, such as fluids spilling inside the instrument, follow the steps below:

1. Switch OFF the instrument (Figure 2–4).

2. Unplug the instrument immediately from the power supply (Figure 2–4).

3. Carry out appropriate corrective measures. However, do not disassemble the instrument.

4. If the corrective measures taken do not help, contact authorized technical service or your local Thermo Fisher Scientific representative.

Chapter 5
Maintenance

Regular and preventive maintenance

For reliable daily operation, keep the instrument free of dust and liquid spills.

Abrasive cleaning agents are not recommended, because they are likely to damage the paint finish.

It is recommended that you clean the case of the instrument periodically to maintain its good appearance. A soft cloth dampened in a warm, mild detergent solution will be sufficient.

Clean the outside of the instrument and the turntable with clean low-pressure compressed air or a cloth dampened with water or a mild detergent when necessary.

Although the KingFisher Flex is constructed from high-quality materials, you must immediately wipe away spilt saline solutions, solvents, acids or alkaline solutions from outer surfaces to prevent damage.

Caution Painted surfaces can be cleaned with most laboratory detergents. Dilute the cleaning agent as recommended by the manufacturer. Do not expose the surfaces to concentrated acids or concentrated alcohols for prolonged periods of time as damage may occur. ▲

Clean the display areas with a mild laboratory detergent. The keypad has a wipe-clean surface.

Plastic covers and surfaces can be cleaned with a mild laboratory detergent or alcohol.

Warning If any surfaces are contaminated with biohazardous material, a mild sterilizing solution should be used. ▲

Caution Do not autoclave any part of this instrument except the shield plate. ▲

How to clean the turntable

Keep the turntable surface clean to avoid dust and dirt entering into the instrument. Clean the turntable surface at least once a week using a soft

cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol.

The turntable can be detached for cleaning purposes (Figure 5–49 through Figure 5–51).

Unscrew the two finger screws (Figure 5–49). Note that the screws still remain attached to the turntable when the screws are unfastened.

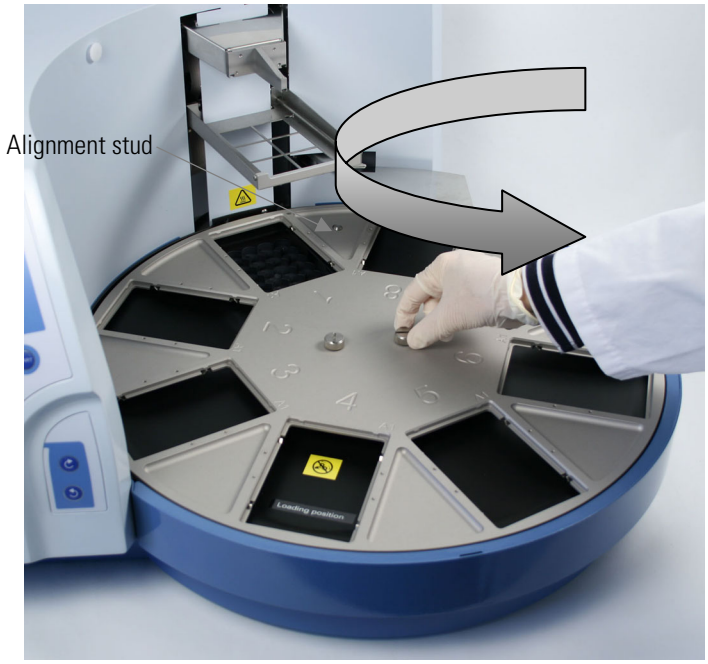


Figure 5–49. Unfastening the two finger screws

Lift the turntable off (Figure 5–50).

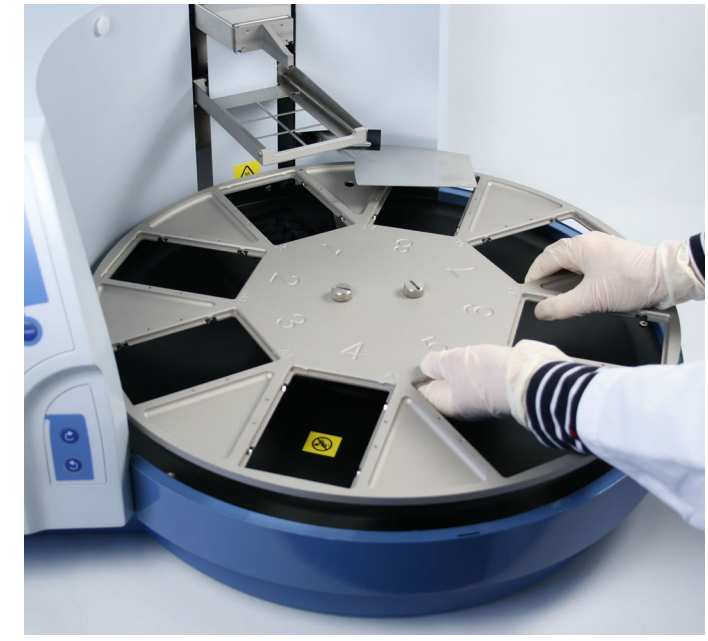


Figure 5–50. Removing the turntable

If you have spilt infectious agents on the turntable, clean it with a cloth dampened with water or a mild detergent.

Clean the black spill shield (Figure 5–51) and the turntable using a soft cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol.

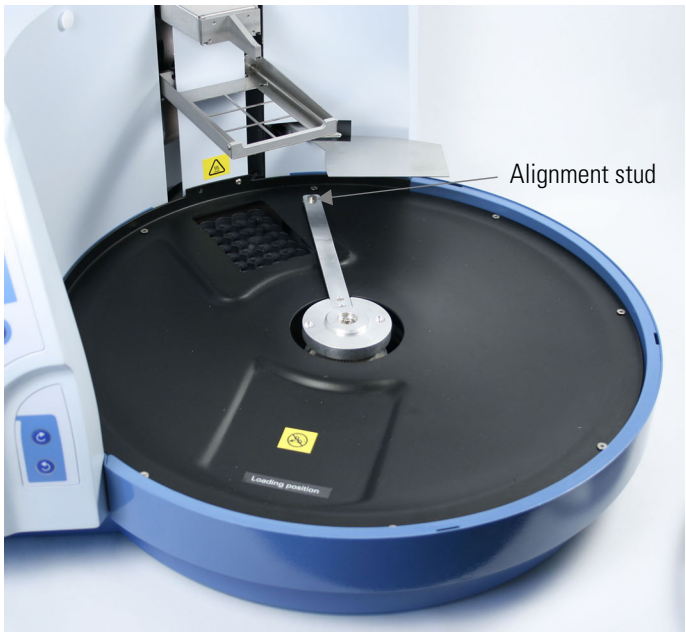


Figure 5–51. Black spill shield exposed for cleaning

When you replace the turntable, insert the turntable so that you place it first onto the aligning stud. Then fasten the two finger screws.

You can gently rotate the turntable while the instrument is switched off.

How to clean the magnetic rods

If required, wipe the magnetic rods using a soft cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol.

Caution The KingFisher Flex should not be kept in close proximity to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads.
Do not hold the KingFisher Flex heads close to a PC display, since this may cause damage to the display.
Do not use metal tools when handling KingFisher Flex heads.
Be careful not to break the magnets while cleaning. ▲

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field. ▲

How to clean the shield plate

If required, wipe the shield plate using a soft cloth or tissue paper soaked in a mild detergent solution (SDS), soap solution or alcohol. The shield plate is autoclavable (at 1 bar pressure and 121°C for 20 minutes).

Disposal of materials

Follow laboratory and country-specific procedures for the disposal of biohazardous or radioactive waste. Refer to local regulations for the disposal of infectious material.

Warning The samples can be potentially infectious. Dispose of all used plates, disposable gloves, syringes, disposable tips, and so on as biohazardous waste. ▲

Decontamination procedure

Decontamination should be performed in accordance with normal laboratory procedures. Any decontamination instructions provided with the reagents used should be followed.

A decontamination procedure is only recommendable when infectious substances have been in direct contact with any part(s) of the instrument.

If there is a risk of contamination with biohazardous material, the procedure recommended below or some other corresponding decontamination procedure must be performed.

It is strongly recommended to perform the complete decontamination procedure before relocating the instrument from one laboratory to another or before sending it to service.

Decontamination is not required for the proper functioning of the instrument.

Example of decontaminants:

- Ethanol 70%
- Virkon solution 1 – 3%
- Glutaraldehyde solution 4%
- Chloramine T
- Microcide SQ 1:64

Warning The decontamination procedure should be performed by authorized trained personnel wearing disposable gloves, protective glasses and clothing in a well-ventilated room. ▲

1. Prepare the decontaminant: 200 ml 4% glutaraldehyde solution (or another agent recommended by your safety officer).

2. Empty the turntable.

3. Switch OFF the power and disconnect the mains supply cable (Figure 3–14).

4. Disinfect the outside of the instrument using a cloth dampened with 70% ethanol.

5. Place the instrument in a large plastic bag. Ensure that the see-through lid has been removed.

6. Place a cloth soaked in the prepared solution into the bag. Ensure that the cloth does not make contact with the instrument.

7. Close the bag firmly and leave the instrument in the bag for at least 24 hours.

8. Remove the instrument from the bag.

9. Clean the instrument using a mild detergent.

10. Remove any stains using 70% ethanol.

11. After performing this decontamination procedure, enclose a signed and dated Certificate of Decontamination both inside the transport package and attached to the outside of the package (see Appendix A: “Certificate of Decontamination”).

Packing for service

To pack for service, follow the guidelines presented below.

Caution It is important that the instrument is thoroughly decontaminated before it is removed from the laboratory or any servicing is performed on it. ▲

When you ship the instrument for service, remember to:

- Inform about the use of hazardous materials.
- Decontaminate the instrument beforehand.
- Install the transport locks.
- Place the KingFisher Flex head into its transportation box.
- Pack the instrument according to the enclosed packing instructions.

- Use the original packaging to ensure that no damage will occur to the instrument during shipping. Any damage will incur additional labor charges.
- Enclose a dated and signed Certificate of Decontamination (see Appendix A: “Certificate of Decontamination”) both inside and attached to the outside of the package, in which you return your instrument (or other items).
- Enclose the return goods authorization number (RGA) given by your Thermo Fisher Scientific representative.
- Indicate the fault after you have been in touch with your local Thermo Fisher Scientific representative or Thermo Fisher Scientific’s technical service department.

Refer to “General specifications” on page 71 for details on storage and transportation temperatures.

Service contracts

It is recommended to maintain and service the instrument regularly every 12 months on a contract basis by the manufacturer's trained service engineers. This ensures that the product is properly maintained and gives trouble-free service. Contact the Thermo Fisher Scientific technical service department for more details.

Disposal of the instrument

If the KingFisher Flex has to be disposed of, follow the guidelines below.

Warning Decontaminate the instrument before disposal. Refer to “Decontamination procedure” on page 66 and “Certificate of Decontamination” on page 82 about decontamination. ▲

Follow laboratory and country-specific procedures for biohazardous or radioactive waste disposal.

Dispose of the instrument according to the legislation stipulated by the local authorities concerning take-back of electronic equipment and waste. The procedures vary by country.

Pollution degree	2 (see “Safety specifications” on page 72)
Method of disposal	Electronic waste Contaminated waste (Infectious waste)

WEEE symbol Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State (European Country), and this product should be disposed of or recycled through them. Further information on Thermo Fisher Scientific's compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at **www.thermo.com/WEEERoHS**. ▲

Regarding the original packaging and packing materials, use the recycling operators known to you.

For more information, contact your local Thermo Fisher Scientific representative.

Chapter 6
Technical Specifications

General specifications

Thermo Fisher Scientific reserves the right to change any specifications without prior notice as part of our continuous product development program. The general specifications are presented in Table 6–6.

Table 6–6. General specifications

General specifications	
Overall dimensions	
– instrument	*ca.* 680 mm (W) x 600 mm (D) x 380 mm (H) [26.8″ (W) x 23.6″ (D) x 15″ (H)]
– transport package	800 mm (W) x 1200 mm (D) x 710 mm (H) 31.5″ (W) x 47.2″ (D) x 28″ (H)
Weight	
– instrument	*ca.* 28 kg [62 lbs.]
– incl. transport package	*ca.* 44 kg [97 lbs.]
Operating conditions (indoor use)	+5°C to +40°C; maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C Indoor use only
Transportation conditions	-40°C to +60°C, packed in transport packaging
Storage conditions	-25°C to +50°C, packed in transport packaging
Mains power supply	100 – 240 Vac, 50/60 Hz, nominal Automatic voltage detection
Power consumption	150 VA max.; 55 VA standby
Heat dissipation	341 BTU max.
Computer interface	USB or serial RS-232C port. Baud rate 9600. Character format 1 start bit, 8 data bits, 1 stop bit, and no parity. Flow control XON/XOFF.
Internal software	Space for max. 512 internal protocols
Normal use	10 runs/day, 250 days/year, with 40 min protocols having a medium speed setting, RT

Performance specifications

The performance specifications are presented in Table 6–7.

Table 6–7. Performance specifications

Performance specifications	
Processing volume	24: 200 µl – 5 mL 96: 20 – 1000 µl

Continued

Cont.

Performance specifications	
Capacity	96 samples/run
Collection efficiency of the particles (indoor use)	> 95%, KingFisher 96 plate, neutral wash buffer containing detergent, 2.8 µm particles, 3 collections, RT
Magnetic particle size	*ca.* > 1 µm
Magnet rods	24 or 96 in one frame Interchangeable KingFisher Flex heads
Plate types (disposable) * Recommended filling volume	24 / 96-well plates: – KingFisher 24 deep well plate (200 µl – 5 mL*) – Microtiter deep well 96 plate (50 – 1000 µl*) – KingFisher 96 plate (20 – 200 µl*) – PCR plate (20 – 100 µl*), skirted
Tip combs (polypropylene – disposable)	24 / 96 in one frame – for KingFisher 24 deep well plate – for Microtiter deep well 96 plate – for KingFisher 96 plate – for PCR plate
Heating block temperature	From +5°C above ambient temperature to +115°C
Heating block accuracy	± 1°C, up to +80°C, ± 2°C, up to +115°C, instrument in RT
Keyboard / Display	**START** / **PAUSE** / **STOP** / **OK** / **TURNTABLE ROTATING CLOCKWISE** / **TURNTABLE ROTATING COUNTERCLOCKWISE** / four cursor keys / LCD

Safety specifications

This section describes the safety specifications for the KingFisher Flex instrument.

In conformity with the requirements

KingFisher Flex bears the following markings:
Type 711
100 – 240 Vac, 50/60 Hz, 150 VA
CE mark
CSA

KingFisher Flex conforms to the following requirements:
2006/95/EC (Low Voltage Directive)
2004/108/EC (Electromagnetic Compatibility Directive, EMC)
FCC Part 15, Subpart B/Class B (July 2004)
2002/96/EC (Waste of Electrical and Electronic Equipment)

Safety performance:
EN 61010-1:2001 (Ed. 2),
including US and CA National differences
EN 61010-2-010:2003 (Ed. 2)
EN 61010-2-101:2002 Particular Requirements for In Vitro Diagnostic (IVD) Medical Equipment

The safety specifications are also met under the following environmental conditions in addition to or in excess of those stated in the operating conditions:	
Altitude	Up to 2000 m
Temperature	+5°C to +40°C
Humidity	Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C
Mains supply fluctuations	± 10% from nominal
Installation category (overvoltage category)	II according to IEC 60664-1 (see **Note** 1)
Pollution degree	2 according to IEC 60664-1 (see **Note** 2)

Note 1) The *installation category* (overvoltage category) defines the level of transient overvoltage which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its overvoltage protection means. For example, in CAT II which is the category used for instruments in installations supplied from a supply comparable to public mains, such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500 V for a 230 V supply and 1500 V for a 120 V supply.

2) The *pollution degree* describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only nonconductive pollution, such as dust, occurs with the exception of occasional conductivity caused by condensation. ▲

Technical Specifications
In conformity with the requirements

Chapter 7
Frequently Asked Questions

Q&As

Q1: What does the KingFisher Flex system do?

A1: Thermo Fisher Scientific now offers a complete KingFisher Flex system – the magnetic particle processor – for the purification and processing of proteins, DNA, RNA and cells in a 24 or 96-well format. The processor handles particles automatically according to the preloaded purification protocols. For more information on these applications, contact Thermo Fisher Scientific Oy.

Q2: What plates can be used with the KingFisher Flex?

A2: The KingFisher Flex is compatible with four different plate types: KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates. Each plate type has an optimized KingFisher Flex head and tips. Of the four plates, the KingFisher 96 plate can be used with all three kinds of magnets (for example, KingFisher 96 plates can be used together in a protocol with either Microtiter deep well 96 plates or PCR plates).

Q3: Can I use plates from other manufacturers?

A3: No, it is highly recommended to use plates listed in Table 9–11 on page 83. These plates are specifically designed to be used with KingFisher Flex tip combs to attain maximal performance. Plates from other manufacturers may not be compatible with the KingFisher Flex heating blocks. They may also cause unexpected problems, such as cross-contamination, due to the divergent well volume and bottom height of the plate.

Q4: Will the magnet get weaker? If so, how long can they be used?

A4: The KingFisher Flex magnets are made of material that is very stable. The magnetic field will not get weaker. However, extreme mechanical force or heating can cause damage to the magnets.

Caution It is very important to keep the KingFisher Flex heads away from each other and other magnets at all times. Clashing of the magnets together may cause serious damage to the magnets. ▲

Q5: How strong are the magnets? Can they, for example, disturb some sensitive equipment?

A5: The KingFisher Flex should not be kept in close proximity to magnetic tapes, computer discs or other magnetic storage systems, such as credit cards, as these can be damaged by the strong magnetic field of the KingFisher Flex heads.

Do not hold the KingFisher Flex heads close to a PC display, since this may cause damage to the display. Do not use metal tools when handling KingFisher Flex heads.

Warning This product contains very strong permanent magnets. People wearing a pacemaker or metallic prostheses should not use this product. A pacemaker or prostheses may be affected or damaged if it comes in close contact with a strong magnetic field. ▲

Q6: How can the KingFisher Flex heads be changed?

A6: By running the Change_magnet protocol under the **Maintenance** menu using the up and down cursor keys.

Q7: Can I concentrate the sample during the run?

A7: Both deep well plates and KingFisher 96 plates can be used during the same run. Therefore, it is possible to start the processing by using larger volumes (in a deep well plate) and elute the purified sample to a smaller volume (in a KingFisher 96 plate).

Q8: How does the heating block work?

A8: The heating block is located inside the instrument and can be used automatically during the protocol. All KingFisher Flex plates can be heated using specially designed, interchangeable heating blocks. Any number of heating steps can be added to the protocol. During the protocol, when the protocol enters the heating step, the plate is automatically moved to the dedicated heating position for heating. After the heating step the protocol continues automatically to the next step.

Note No cooling steps can be added. ▲

Q9: How long does it take the heater to warm up from RT to 80 °C?

A9: The heating block warms up about 10 degrees per minute, so it will take about 6 minutes.

Q10: What should I do if the magnets set are dirty?

A10: Wipe the magnetic rods with a soft cloth or tissue paper soaked in a mild detergent solution, soap solution or alcohol.

Q11: What should I do if I forget to insert the tip combs into the tip comb holder?

A11: The protocol will not start without the tip combs inserted into the tip comb holder.

Q12: What if the magnetic particles remained in the sample well?

A12: If the starting material is too viscose, the magnetic rods will not be able to collect the particles. Dilute the sample and check that the sample is properly homogenized/lysed.

Adding low amounts of detergent will improve the collection of magnetic particles as well.

Quickly centrifuge the plate to sediment the particles to the bottom of the plate.

Q13: What if the magnetic particles are attached to the tip combs after the run?

A13: This happens sometimes but it will not affect the yield because the sample has been released from the particles.

Q14: Are the volumes of reagents in each well critical?

A14: It is strongly recommended that you keep the specified volumes within the defined limits to avoid spillover in the performance of the chemical reactions and the processor and to keep the best performance at the most efficient level.

Q15: Is it always compulsory to use the transport locks?

A15: The transport locks are only necessary when relocating the instrument.

Q16: What should you do if the tip loading does not succeed?

A16: Try first to manually stretch the tips both lengthwise and width wise to level the tip comb.

Chapter 8
Troubleshooting Guide

Note Do not use the instrument if it appears that it does not function properly. ▲

Note that the instrument does not verify the logic flow of the received commands.

Error messages and warnings

When an error is detected, the current operation is terminated. After an error, it is best to abort the current run and restart from the beginning after the problem is fixed. The KingFisher Flex internal software has the following error messages and warnings (Table 8–8).

Table 8–8. Error messages reported

Code	Error message	Description
0	No error	–
1	The command was not recognized as a valid command	The command was not recognized as a valid KingFisher Flex command.
2	The tip comb holder lifting mechanism is out of position	The magnetic head position is in error.
3	The turntable rotating mechanism is out of position	The turntable position is in error.
4	The magnetic head holder lifting mechanism is out of position	The magnetic tips lift position is in error.
5	The heating block lifting mechanism is out of position	The heater lift position is in error.
6	The shield plate turning mechanism is out of position	The shield plate position is in error.
7	Serial number already set	Attempt to set the serial number when it is already set.
8	Invalid command parameter	Invalid command argument.
9	Permanent parameters lost	Nonvolatile parameters lost.
10	Protocol name already used in other directory	Cannot record a protocol with the same name to another directory.
11	Internal software error	Internal software error. This error is actually never reported because the firmware halts on detection of an internal error. However, this error may show up in the error log.
12	The requested movement is not	Cannot perform the requested movement. For example, the head and

Continued

Cont.

Code	Error message	Description
	allowed	the magnets cannot move down when the shield plate is in place, or the turntable cannot rotate when the heater is up.
13	The plastic tip comb is not attached to the holder	No plastic tips attached to the head. The range of movement of the head and the magnets is limited if the tips are not attached to the head. This is to prevent bringing the magnets in direct contact with the magnetic particle solution.
14	The magnetic head is not inserted to holder	The magnets are missing. The range of movement of the head and the magnets is limited if the magnets are not attached to the magnet lift. This is to prevent running a purification sequence without the magnets.
15	The command is not recordable	The command is not recordable. This error is reported if a nonrecordable command is received when recording is on.
16	Not enough memory available for recording operation	Not enough memory available for operation. For example, maximum exceeded in recording.
Code	**Warning**	**Description**
100	Timer expired	Timer already expired. This warning is reported if a wait for a timer (WAI) command is executed and the timer has already expired.

Troubleshooting guide

A troubleshooting guide for the KingFisher Flex instrument is presented in Table 8–9.

Table 8–9. Actions taken against error messages and warnings

Code	Error message	Action
0	No error	–
1	The command was not recognized as a valid command	Contact authorized technical service.
2	The tip comb holder lifting mechanism is out of position	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
3	The turntable rotating mechanism is out of position	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
4	The magnetic head holder lifting mechanism is out of position	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
5	The heating block lifting mechanism is out of position	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
6	The shield plate turning mechanism is out of position	Switch the instrument OFF and ON, and try again. If the error appears during initialization or is otherwise repeated, contact service.
7	Serial number already set	Contact authorized technical service.
8	Invalid command parameter	Contact authorized technical service.
9	Permanent parameters lost	Contact authorized technical service.
10	Protocol name already used in other directory	Either record to the directory where the protocol is or delete the original protocol before recording this new one.
11	Internal software error	Contact authorized technical service.

Continued

Cont.

12	The requested movement is not allowed	Press the **STOP** button twice.
13	The plastic tip comb is not attached to the holder	Check if the tips are present. If it looks all right, turn ON and OFF, and run the check protocol according to the KingFisher Flex head and plastics you are using (see "Operational check" on page 34).
14	The magnetic head is not inserted to holder	Check that the magnets are fully inserted.
15	The command is not recordable	Contact authorized technical service.
16	Not enough memory available for recording operation	Delete some unnecessary protocols from the internal memory with BindIt Software and try again. Repeat this procedure until the protocol fits. It is recommended that you clean up the program memory from unnecessary protocols about once a month to prevent this error from occurring.
Code	**Warning**	**Description**
100	Timer expired	Contact authorized technical service.

Service request protocol

If the KingFisher Flex requires service, contact your local Thermo Fisher Scientific representative or the Thermo Fisher Scientific technical service department. Do not under any circumstances send the instrument for service without any prior contact. It is imperative to indicate the fault and nature of the required service. This will ensure a faster return of the instrument to the customer.

Your local Thermo Fisher Scientific representative or distributor will take care of sending a complaint form (that is, the Warranty Claim Technical Sheet) to the Thermo Fisher Scientific technical service department. The Warranty Claim Technical Sheet contains a more detailed description of the fault, symptom or condition. Give all the necessary information to the distributor, who will fill out and forward the Warranty Claim Technical Sheet to the Thermo Fisher Scientific technical service department.

Check "Packing for service" on page 67. You will find instructions on how to proceed before shipping the instrument for service to Thermo Fisher Scientific Oy.

Check that any necessary decontamination procedure has been carried out before packing. Refer to "Decontamination procedure" on page 66 and "Certificate of Decontamination" on page 82. Ensure that the Certificate of Decontamination (see Appendix A: "Certificate of Decontamination") as well as the return authorization number (RGA) are sent with the instrument.

The Thermo Fisher Scientific technical service department will keep you up to date with the progress of service and provide you with any further details you might need, for example, on maintenance, serviceability, troubleshooting and replacement.

Certificate of Decontamination

The decontamination procedure is required before shipping the instrument to Thermo Fisher Scientific Oy, for example, for repair. If, for any reason, the instrument is shipped back to Thermo Fisher Scientific Oy, it must be accompanied by a dated and signed Certificate of Decontamination, which must be both enclosed and attached to the outside of the package containing the instrument. Refer to Appendix A: "Certificate of Decontamination" and "Decontamination procedure" on page 66.

Failure to confirm decontamination will incur additional labor charges or at worst the items will be returned for proper cleaning. Before returning any instrument(s) or item(s), ensure that they are fully decontaminated. Confirm A or B status. Refer to Appendix A: "Certificate of Decontamination".

Chapter 9
Ordering Information

Contact your local Thermo Fisher Scientific representative for ordering and service information. Ordering information codes are presented in Table 9–10 through Table 9–12.

KingFisher Flex

Table 9–10. Codes for products

Code	Instrument / System
5400610	KingFisher Flex – 96 PCR head
5400620	KingFisher Flex – 96 KF head
5400630	KingFisher Flex – 96 deep well head
5400640	KingFisher Flex – 24 deep well plate

List of accessories and consumables

Table 9–11. Codes for accessories and consumables

Code	Item	Quantity
N07669	*KingFisher Flex User Manual*	1
N07974	*BindIt Software User Manual*	1
5189010	BindIt Software package	1
24074411	KingFisher Flex 96 PCR head and heating block	1
24074421	KingFisher Flex 96 KF head and heating block	1
24074431	KingFisher Flex 96 deep well head and deep well and KF heating blocks	1
24074441	KingFisher Flex 24 deep well head and heating block	1
24074410	KingFisher Flex 96 PCR head	1
24074420	KingFisher Flex KF head	1
24074430	KingFisher Flex 96 deep well head	1
24074440	KingFisher Flex 24 deep well head	1
24075410	KingFisher Flex 96 PCR heating block	1
24075420	KingFisher Flex 96 KF heating block	1
24075430	KingFisher Flex 96 deep well heating block	1
24075440	KingFisher Flex 24 deep well heating block	1
97002514	KingFisher Flex 96 tip comb for PCR magnets	80 pcs

Continued

Cont.

Code	Item	Quantity
97002524	KingFisher Flex 96 tip comb for KF 96 magnets	100 pcs
97002534	KingFisher Flex 96 tip comb for DW magnets	100 pcs
97002610	KingFisher Flex 24 deep well tip comb and plate	50 pcs of each
97002540	KingFisher 96 KF plate (200 µl)	48 pcs
95040450	Microtiter deep well 96 plate, V-bottom	50 pcs
95040460	Microtiter deep well 96 plate, V-bottom, sterile	50 pcs
95040470	KingFisher Flex 24 deep well plate	50 pcs
95040480	KingFisher Flex 24 deep well plate sterile	50 pcs

List of spare parts

Table 9–12. Codes for spare parts

Code	Item	Quantity
2305290	Serial cable F9/F25 (for RS-232C port)	1
N04001	USB A-B device cable 1.8 m*	1

* Longer USB cables available from PC stores

Chapter 10
References

Keywords for web pages

bead-based
beads
biopanning
cell enrichment
cell purification
cell separation
DNA
DNA extraction
DNA immobilization
DNA isolation
DNA purification
DNA strand separation
DNA template
double-stranded DNA
genomics DNA
genomics
GST-tag proteins
His-tag proteins
immunomagnetic separation
immunoprecipitation
KingFisher
magnetic beads
magnetic capture
magnetic microspheres
magnetic particles
magnetic separation
microspheres
nucleic acids
oligo-dT
particles
PCR product
phage display
post PCR purification
primer
processing
processor
protein purification
proteomics
purification
RNA
mRNA
recombinant protein purification
RT-PCR
separation
silica-coated particles
streptavidin-coated beads
streptavidin-coated particles
superparamagnetic beads
superparamagnetic microspheres
Thermo Fisher Scientific
Thermo Scientific

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Appendix A
Certificate of Decontamination

Name: _____

Address: _____

Tel./Fax: _____

Name: _____ Serial no.: _____

A) I confirm that the returned items have not been contaminated by body fluids, toxic, carcinogenic or radioactive materials or any other hazardous materials.

B) I confirm that the returned items have been decontaminated and can be handled without exposing the personnel to health hazards.

Materials used in the unit: Chemicals + Biological • Radioactive *)

Specific information about contaminants:

_____

_____

Decontamination procedure[1]:

_____

_____

Date and place: _____

Signature: _____

Name (block capitals): _____

*) The signature of a Radiation Safety Officer is also required when the unit has been used with radioactive materials.

This unit is certified by the undersigned to be free of radioactive contamination.

Date and place: _____

Signature: _____

Name (block capitals): _____

PHOTOCOPIABLE

[1] Please include decontaminating solution used.

Appendix B
Thermo Scientific KingFisher Flex Feedback Form

Instrument: Thermo Scientific KingFisher Flex ☐ Instrument serial no.:

PURCHASED BY	**PURCHASED FROM**
Company/Institute	Distributor
Department	Address
Address	
Tel.	Tel.
Fax	Date of delivery
Internet home page	
Date of purchase	
Your application area	
Dr. ☐ Mr. ☐ Mrs. ☐ Ms. ☐	Job title/Position
Surname (block capitals)	First name (block capitals)
Internet e-mail address	

	Excellent	Above expectations	As expected	Below expectations	Comments
Instrument installation	☐	☐	☐	☐	
Ease of use	☐	☐	☐	☐	
Flexibility	☐	☐	☐	☐	
User manual	☐	☐	☐	☐	
Software	☐	☐	☐	☐	
Customer support	☐	☐	☐	☐	
Overall	☐	☐	☐	☐	

Additional instrument and/or software features desired:

Did you encounter any problems?

Where did you first learn about the product?

Would you like to receive information about other Thermo Scientific products?

Glossary

heating block There are four different kinds of interchangeable heating blocks available, that is, for KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates (Figure 4–48).

KingFisher Flex head There are four kinds of interchangeable KingFisher Flex heads available, for KingFisher 24 deep well plates, Microtiter deep well 96 plates, KingFisher 96 plates, and PCR plates. The KingFisher Flex heads all have corresponding disposable plastic tip combs.

magnetic bead (magnetic particle) The magnetic particles attach to the magnetic rods (Figure 2–7 and Figure 2–8) that are protected by a disposable tip comb. The magnetic particles enable the purification of a variety of target molecules.

magnetic rod The rods which are magnetic and collect magnetic particles (Figure 4–43). The rods do not collect the particles on their own, the magnetic rods must always be protected by a tip comb.

plate The disposable plates (1 – 8) where all the reagents and samples are located and where the processing takes place. Four different types of 24 and 96-well plates (Figure 4–45) that can be used are as follows:

- KingFisher 24 deep well plate (200 µl – 5 mL*)
- Microtiter deep well 96 plate (50 – 1000 µl*)
- KingFisher 96 plate (20 – 200 µl*)
- PCR plate (20 – 100 µl*), skirted

* = recommended filling volume

shield plate When the turntable moves, the shield plate moves over the plate underneath (Figure 4–44) forming a protective cover.

tip comb Protects the magnetic rods (24 or 96 in a frame). A disposable tip comb always has to be placed onto the microplate prior to processing. There are four different kinds of disposable tip combs available:

- for KingFisher 24 deep well plates
- for Microtiter deep well 96 plates
- for KingFisher 96 plates
- for PCR plates

turntable A turntable with eight plate stations that can be detached for cleaning purposes (Figure 2–2).

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